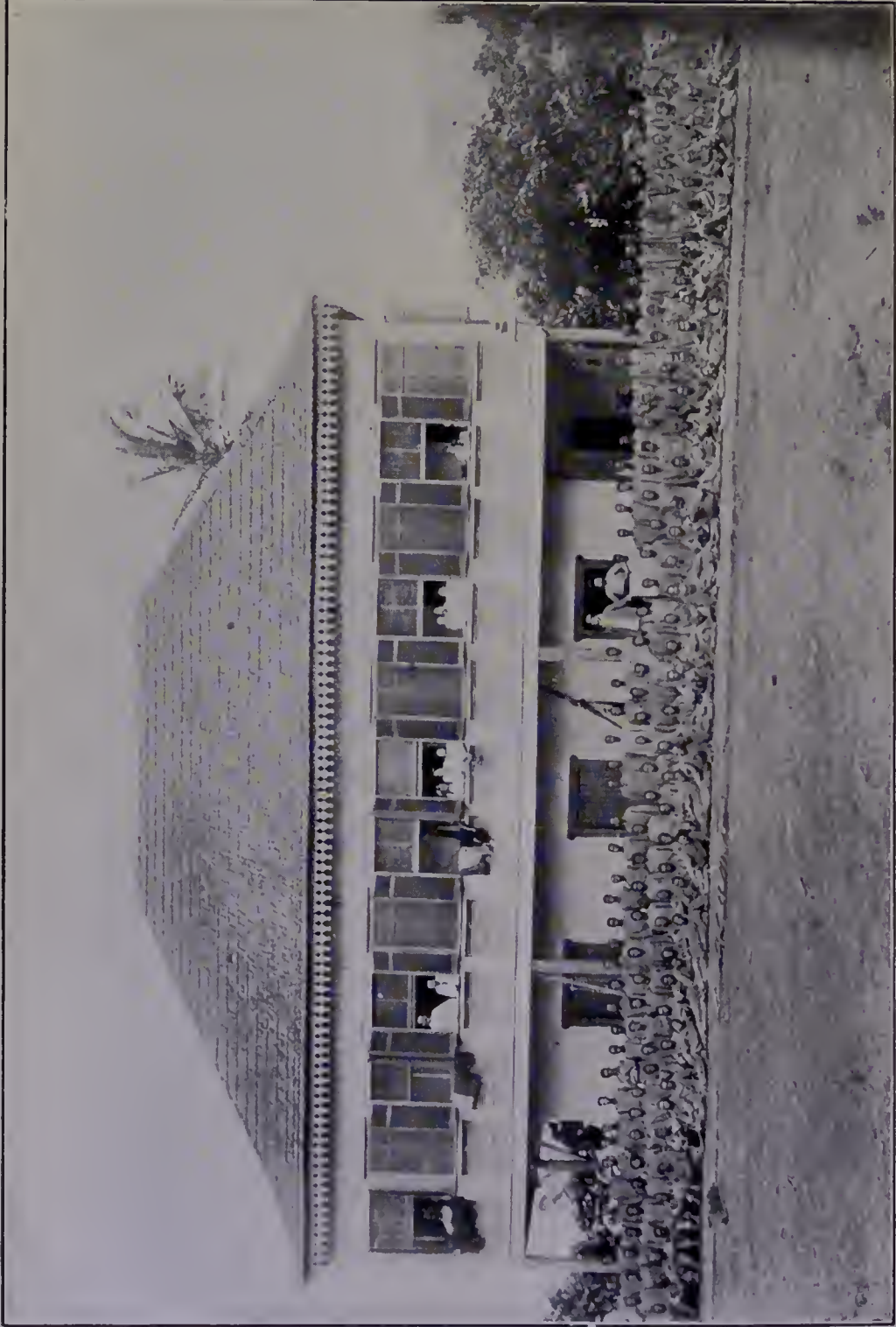


SLEEPING SICKNESS IN
THE ISLAND OF PRINCIPE.



One of the houses of the *Dependencia* Pincaté on the Porto Real property, surrounded by a wide swamp known as Ribeira Gallinha. This house was so unhealthy that it was proposed to abandon it. Now that the sanitation of its surroundings has been effected it has become one of the healthiest on the Estate

Sleeping Sickness in The Island of Principe

SANITATION, STATISTICS, HOSPITAL
SERVICES, AND WORK OF OFFICIAL
CONSERVANCY BRIGADE

BY

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SLEEPING SICKNESS IN THE ISLAND OF PRINCIPE

HISTORY.—It is known that sleeping sickness has been in existence for more than a century on the West Coast of Africa, and it is supposed that the Island of Principe, before 1820, not only did not possess the carrier fly, but had no recorded case of that horrible disease. As Principe was for many years an entrepôt of cattle and of labourers, it is presumable that the *tze-tze* fly was imported from the Gaboon, where it was numerous, so the *serviçaes* coming from that region asserted.

In or about 1825, the fly, known in the island as the *Gaboon fly* (*Mosca do Gabão*) must have been introduced along with the cattle from the West African coast, especially the Gaboon.

For the sake of historic clearness, let us mention that at that time and for some years later, a lady lived there, Dona Maria Corrêa, who owned almost the whole of the island and had magnificent palaces in the north and east of it. Her favourite residence was in the lands now forming the Ribeira Izé estate, where she had a church whose ruins still testify to its sumptuousness.

Dona Maria Corrêa, besides being a great landowner in the island, carried on a large trade, chiefly in cattle brought from different parts of the west coast of Africa, both from Angola, the Mina Coast, and the Gaboon; but her principal source of importation for cattle was the last-named, as being the nearest to the island. At that period, labourers and cattle alike used to be brought over in small, shallow-bottomed

boats, for these were the easiest to beach for the purpose of embarkation and the reverse. Filipe Xavier Paixão, a native who was then one of the crew of one of these boats, used to say that the Gaboon fly was not to be found on the island, and that beyond a doubt it must have been brought there along with the cattle, these and the labourers being both disembarked on the beach at Ribeira Izé, proceeding thence to the various depôts, as, Ponte de Mina, Simaló, and West Bay. This opinion of Paixão was shared by a god-daughter of Dona Maria Corrêa, named Delphina, who only died about a year ago. Both pieces of evidence must be pretty close to the truth, for it is known that it was in the north of the island that the largest quantity of *tze-tze* fly appeared, spreading thence to the other parts, where the conditions for its reproduction were as favourable as those of the north. It appears that, up to 1890, the sting of the fly was regarded as harmless, for this was the opinion of the majority of the old native hands, and cases of sleeping sickness were very rare. So long as the labouring establishments drawn from Angola were relatively scanty, cases of sleeping sickness were insignificant in number; but later on, when in 1893 and 1894 the importation of Angolan *serviçaes* (principally from the vicinity of Cazengo, where the disease had attained an enormous development), assumed larger proportions, the malady began to spread to the extent that is now known to us all. These facts have been obligingly furnished to us by Sr. Manoel dos Santos Abreu, administrator of the Porto Real estates, who has lived nearly twenty-five years in the island.

Reasons why the disease has not sensibly diminished hitherto; but has tended to progress.

As is obvious from its history, sleeping sickness has existed for many years in Principe, and, as nobody thought of checking it, it was let go to such an extent as to threaten with extinction the whole population of the island. On this account, the Government, in 1907, so as to put a barrier in the way of the frightful spread of this disease, appointed a medical commission, which spent a year here carrying out

experimental studies, and propounding remedies of a prophylactic order towards the elimination of a scourge which year by year wiped out hundreds of souls.

As the prophylactic measures recommended by the mission under Captain Corrêa Mendes did not pass into law, but from 1908-1910 merely stood on paper, to the grave disgrace of agriculture and humanity, the stay of that mission on the island brought no benefit to the situation. Sleeping sickness could only decrease when those interested, the inhabitants themselves, carried out the measures recommended, and the Government gave them all the help it could; but, unfortunately for the credit of our colonisation, this did not take place, seeing that, up to the close of 1910, nobody gave another thought to the lamentable state of the island.

In February 1911, the ex-governor of S. Thomé and Príncipe, Sr. Miranda Guedes, with that spirit of humanity which characterises him, gave legal force to the prophylactic measures advised by the Corrêa Mendes mission, and he himself went to the island with the object of convincing, by personal counsel the inhabitants of the necessity for obeying resignedly a law which no doubt laid heavy burdens upon them, but would repay their sacrifices in the end in the form of valuable results due to the execution of those measures.

We owe to Governor Miranda Guedes the first formation of the official brigade (conservancy gang) against the spread of the disease, which, by the good work it has done, has to a very great extent contributed to the present well-being of the island. The measures enforced by the ex-governor's notifications were subsequently, with minor modifications, confirmed by decree, 17th April 1911, by the Central Government (Lisbon).

Unfortunately, the majority of the planters had not by then grasped the fact that the full execution of the prophylactic measures would bring about as a necessary consequence the palpable improvements they now see, convinced as they are by the outcome of the sanitary work they themselves have carried out on their properties with judgment and intelligence.

The departure of Governor Miranda Guedes from S. Thomé, and the arrival of doctors for the composition of the commission, from the simple fact that the detachment belonged to them, had a certain disorganising effect upon the work of prophylaxis, both on the part of the doctors and of the planters; thus only can it be explained that up to August 1912, when we were sent here by the ex-Governor Marianno Martins, sanitary measures had not everywhere been put into execution, seriously prejudicing the fight against a malady which seemed determined not to loosen its grip of the luckless island of Principe.

When we arrived here in the beginning of August 1912, we had enormous obstacles to contend with in order to persuade certain inhabitants that the law had to be complied with in the spirit and the letter, a thing we only succeeded in accomplishing by the eighth month of our stay here. Now everyone is carrying out the prophylactic measures, and these have given results beyond expectation.

To sum up, sleeping sickness has spread in consequence of :—

- 1st. Government not having translated into law the recommendations of the Corrêa Mendes Commission.
- 2nd. Governor Miranda Guedes' measures, afterwards enforced by decree of the Lisbon Government, not having been well received from the first by the inhabitants.
- 3rd. A want of method which prevailed in the work of fighting the disease, owing to the Medical Mission being governed by the general rule of detached bodies.
- 4th. A lack of elements indispensable to microscopic research.

Work done by the Medical Mission in the ten months between August 1912 and the end of May 1913.

We divided the island of Principe into three zones, so that each doctor might work in his own zone and be in touch with the prophylactic measures carried out in each *roça* (estate), analysing the blood of men and animals so that should these be found attacked by the trypanosome

they might be segregated. The zones were named the first, second, and third.

The first zone includes eight *roças*, namely, Porto-Real (East and West), Mont'Alegre, Praia Inhame, Sant'Anna, Nova Cuba, Saudade, S. João, and the Town (Cidade)—the last including the native population, their *serviçaes*, the *serviçaes* of the brigade and the European population of the town.

The second zone includes the *roças* Abbade, Santo Christo, Nova Estrella, Terreiro Velho, Bella Vista, and Infante D. Henrique (Companhia da Ilha do Principe).

The third zone includes the *roças* Sundy, Ribeira Izé, Bombom, Santa Ritta, Cascalheira, Aguiem, Futuro, Paciencia, and Bellomonte.

The population of the first zone totals 2,356, of whom 1,929 are negro *serviçaes*, 321 children, and 106 Europeans. In this zone we analysed the blood of 2,106 individuals, finding trypanosomes in 59, filaria in 326, and malaria parasites in 160. We also examined the blood of various domestic animals to the number of 93, finding trypanosomes in 26 and filaria in 1.

The total population of the second zone is 1,403, of whom 1,034 are *serviçaes*, 341 children, and 28 Europeans. In this zone the blood of 823 persons was examined, and trypanosomes were found in 17, filaria in 99, and malaria parasites in 86. Of 54 animals examined trypanosomes were found in 7.

The total population of the third zone was 1,179, 1,025 being *serviçaes*, 119 children, and 35 Europeans. The blood of 1,063 persons was examined, finding trypanosomes in 49, filaria in 29, and malaria parasites in 40. The examination of the blood of 51 animals showed trypanosomes in 6 and filaria in 1.

In these three zones the parasites of malaria we noted were of the tertian and autumnal-estival form (tropical) ; we saw in some preparations clear crescent forms.

The filaria observed were *perstans* and with sheaths, the former predominating.

In the period of ten months over which our labours

extended we noted 59 new cases of trypanosomiasis in the first zone, 17 cases in the second, and 49 in the third. That is to say, the percentage of fresh cases to population of the zones is respectively 2.8, 2, and 4.6.

The total population of the island being approximately 4,938, of whom 3,438 are *serviçaes*, 781 children (of *serviçaes*), 430 adult natives, 120 children (of natives), and 169 Europeans, the percentage of total cases of sleeping sickness existing in the island of Principe and that of fresh cases to general population are respectively 7.2 per cent. and 3.1 per cent., which shows that there is a strong tendency for sleeping sickness to disappear from the island, for in 1908 the percentage of population smitten by trypanosomiasis was 23.5 per cent., and to-day, not counting old cases, we have 3 per cent., seeing that we have carried out 3,992 analyses and have found only 125 fresh cases of trypanosomiasis.

The total number of persons attacked is 361, of whom some 50 present every appearance of cures. The percentage of persons attacked by filaria and paludism, to persons examined, is respectively, 11.3 and 7.1 per cent.

We have just spoken of the percentage of individuals examined and total population; let us now go on to show what has been the percentage in the estates in the zones.

FIRST ZONE.—Roça Porto-Real (East and West). Population, 1,078 in all, of whom 889 are *serviçaes*, 163 children, and 26 Europeans. Individuals examined, 875. Trypanosomes observed in 31, filaria in 150, malaria parasites in 59. Animals examined, 56; trypanosomes observed in 19, filaria in 1. Total cases on Roça, 119, 31 being fresh cases. Percentage of fresh cases to individuals examined, 3.5 per cent.; percentage of persons attacked to total population of Roça, 11 per cent.

Roça Mont'Alegre.—Population 66, of whom 49 are *serviçaes*, 13 children, and 2 Europeans. Persons examined 49, 4 of whom had trypanosomes, 3 filaria, and 1 malaria parasites. Animals examined 7, all of whom gave negative results. There are 12 old cases of sleeping sickness. Total

attacked, 16. Percentage of individuals examined and fresh cases, 8.1 per cent.; total cases to population, 32.8 per cent.

Roça Praia Inhamé.—Population 140, of whom 117 are *serviçaes*, 14 children, and 9 Europeans; 136 persons, examined, of whom 10 had trypanosomes, 19 filaria, and 19 malaria parasites. Animals examined, 5, all giving negative results. Percentage of cases of sleeping sickness to persons examined, 7.3 per cent. Persons attacked now on the *Roça*, 7.

Roça Sant'Anna.—Population 89, of whom 80 are *serviçaes*, 7 children, and 2 Europeans. 84 persons examined, all results negative; 5 with filaria, and 18 with malaria. Animals examined, 8, showing one donkey, bought on the island, suffering from trypanosomes. Old cases of sleeping sickness, 6. Percentage of old cases to population, 6.7 per cent.

Roça Saudade.—Population 31, 26 of these being *serviçaes*, 2 children, and 3 Europeans. Persons examined, 26, of whom 1 found with trypanosomes, and 6 with malaria. Existing cases of sleeping sickness, 2, one old, the other a fresh case. Percentage of fresh cases to persons examined, 3.8 per cent.; of total cases to population, 6.4 per cent.

Roça Nova Cuba.—Population 39, of whom 34 are *serviçaes*, 2 children, and 3 Europeans. 30 Persons examined, all results being negative, 7 with filaria, and 7 with paludism. Animals examined, 3, with negative results. No cases of sleeping sickness.

Roça S. João.—Population 66, being 65 *serviçaes* and 1 European. 59 persons examined, 1 being found with trypanosomes, 4 with filaria, and 4 with malaria. Animals examined, 2, with negative results. The new case of sickness came from the *Roça Uba Budo*, when *serviçaes* from that *roça* were passed on to S. João, which belongs to the same proprietor. Percentage to persons examined, 1.6 per cent.

Cidade (Town).—Population 847, 657 being natives and *serviçaes*, 120 children of natives, and 70 Europeans.

847 examined, 12 of whom were found to have trypanosomes, 144 filaria, and 46 paludism. Animals examined, arrived from the south, 12, of whom 6 had trypanosomes. Total of existing sleeping sickness cases, 20. Percentage of fresh cases to persons examined, 1.4 per cent.; of total cases to population, 2.3 per cent.

SECOND ZONE.—Roça Abbade.—Population 151, of whom 123 adults, 24 children, and 4 Europeans; 151 examined, of whom 2 showed trypanosomes, 11 filaria, and 15 paludism. Animals examined, 12, with negative results. Percentage of fresh cases to persons examined, 1.3 per cent. At present 1 person is under suspicion.

Roça Santo Christo.—Population 99, 77 of whom are *serviçaes*, 19 children, and 3 Europeans; 99 examined, of whom 1 had trypanosomes, 17 filaria, and malaria parasites, 9. Animals examined, 6, of whom 1 had trypanosomes. Old cases of sleeping sickness, 2. Percentage of new cases to persons examined, 1 per cent.; of total cases to persons examined, 3 per cent.

Roça Nova Estrella.—Population, 119, 80 of whom are adults, 33 children, and 3 Europeans; 113 examined, all with negative results; 15 with filaria, and 17 with malaria parasites. Animals examined, 1, with positive results. Old sleeping sickness cases still on the estate, 5. Percentage of old cases to population, 4.3 per cent.

Roça Terreiro Velho.—Population 267, of whom 218 are *serviçaes*, 43 children, and 6 Europeans; 242 examined, 10 of whom were found to have trypanosomes, 41 filaria, and 26 malaria parasites. Animals examined, 16, of whom 3 had trypanosomes. Percentage of new cases to persons examined, 3.7. There are at present 6 persons suffering from the disease.

Roça Bella Vista.—Population 154, of whom 142 are *serviçaes*, 8 children, and 4 Europeans; 150 persons examined, 4 of whom were found with trypanosomes, 5 with

filaria, and 15 with malaria. Animals examined, 7, trypanosomes being found in 2. Percentage of persons attacked to persons examined, 2.8. Persons suffering from the disease at present on the *roça*, 3.

Roça Infante D. Henrique.—Population 616, 394 of whom are adults, 214 children, and 8 Europeans. Persons examined, 78, all giving negative results. 10 persons found with filaria, and 4 with malaria. Animals examined, 7, all results negative.

THIRD ZONE: Roça Sundy.—Population 595, of whom 500 are *serviçaes*, 79 children, and 16 Europeans. Persons examined, 516, of whom 37 showed trypanosomes, 18 filaria, and 18 malaria. Animals examined, 24, trypanosomes being found in 5. Old cases of disease still on *roça*, 107, which, added to the fresh cases, makes 144. Percentage of fresh cases to persons examined, is 7.1, and of total cases to population, 24.2 per cent.

Roça Ribeira Izé.—Population 70, of whom 66 are *serviçaes*, 2 children, and 2 Europeans. Persons examined, 70, all giving negative results. Filaria in 3, and malaria parasites in 5. Animals examined, 4, all giving negative results. Old cases of disease, 1. Percentage of persons attacked to population, 1.4 per cent.

Roça Bombom.—Population 66, being 62 *serviçaes*, 2 children, and 2 Europeans. Persons examined, 65, trypanosomes being found in 4, filaria in 3, and malaria parasites in 7. Animals examined, 8, trypanosomes in 1. Percentage of fresh cases to persons examined, 6.1 per cent.

Roça Santa Ritta.—Population 80, of whom 70 are *serviçaes*, 8 children, and 2 Europeans. Persons examined, 80, trypanosomes being found in 1, filaria in 2, and malaria parasites in 1. Animals examined, 5, with negative results. Percentage of persons attacked to those examined, is 1.2 per cent. No cases of the disease.

Roça Cascalheira.—Population 40, of whom 36 are *serviçaes*, 2 children, and 2 Europeans. Persons examined,

36, trypanosomes being found in one, filaria in 1, and malaria parasites in 3. Percentage of persons attacked to those examined, 2.7 per cent.

Roça Aguiem.—Population 29, 24 of whom are *serviçaes*, 4 children, and 1 European. Persons examined, 29, all with negative results, 1 with malaria. Animals examined, 4, in 1 of whom filaria was found.

Roça Futuro.—Population 27, 24 *serviçaes*, and 3 Europeans. Persons examined, 27, trypanosomes being found in 2, filaria in 1, and malaria parasites in 1. Animals examined, 2, both with negative results. Percentage of persons attacked to population, 7.4 per cent.

Roça Paciencia.—Population 159, of whom 140 are *serviçaes*, 16 children, and 3 Europeans. Persons examined, 140, trypanosomes being found in 3, filaria in 1, and malaria parasites in 1. Animals examined, 4, 1 giving positive result. Percentage of fresh cases to individuals examined, 2.1 per cent. Total patients suffering from sleeping sickness, 20, of whom 3 are fresh cases. Total percentage of sufferers to population, 12.6 per cent.

Roça Bellomonte.—Population 113, of whom 102 are *serviçaes*, 7 children, and 4 Europeans. Persons examined, 100, trypanosomes being found in 1, and malaria parasites in 3. Animals examined, 1, result negative. Percentage of persons attacked to those examined, 1 per cent.

The percentages of the estates in the three zones may best be studied in Table A, where are also shown the animals attacked in proportion to those examined. To sum up, it will be seen from that Table that in the First Zone the properties which show the greatest number of fresh cases of trypanosomiasis (human) to persons examined are in the following order (decreasing):—Mont'Alegre, Praia Inhame, Saudade, Porto Real, S. João, and Cidade. In the Second Zone, the *roças* follow the following descending scale:—Terreiro Velho, Bella Vista, Abbade, and Santo Christo; and in the Third Zone—Futuro, Sundy, Bombom, Cascalheira, Paciencia, Santa Ritta, and Bellomonte. In

these three zones the estates showing greatest percentage of fresh cases of trypanosomiasis to persons examined are :—Mont'Alegre, Futuro, Praia Inhame, Sundy, and Bombom. It is the proprietors of these estates who should redouble their efforts to sanitise their *roças*.

It will be seen from the same Table that the percentage of animals attacked is large in the following :—Porto Real, Bella Vista, Sundy, Terreiro Velho, and Santo Christo, a result due to the lack of direction which ruled at first in the carrying out of prophylactic measures.

With the division we have made of the island of Principe into three zones, we cannot for purposes of this study compare present percentages with those of 1908, that is to say, with the time of the Corrêa Mendes Mission: to this end, however, we will divide the island into five zones so as to see clearly which is the area most affected, this being a matter of value for future comparisons. The five zones are thus designated :—Northern, North-Eastern, East-and-West, South, and *Cidade* (town area).

NORTHERN ZONE.—*Roças* Sundy, Santa Ritta, Bombom, Cascalheira, Ribeira Izé, and Aguiem.—Population, 880. Persons examined, 796, showing trypanosomes in 43, filaria in 26, and malaria parasites in 35. Animals examined, 45, showing trypanosomes in 6, and filaria in 1. In this zone, besides the 43 fresh cases, there are 107 old, bringing the total up to 150. Percentage of fresh cases to persons examined, 5.4 per cent., and of total cases to population of zone, 17.1 per cent.

NORTH EASTERN ZONE.—*Roças* Praia Inhame, Sant'Anna, Bellomonte, Paciencia, Futuro, and Saudade. Population, 559. Persons examined, 513, showing trypanosomes in 17, filaria in 26, and malaria parasites in 46. Animals examined, 20, showing trypanosomes in 2. In this zone, besides 17 fresh cases, there are 19 old, making up a total of 36. The percentage of fresh cases to persons examined is 3.3 per cent., and of all cases to population, 7.3 per cent.

EAST-AND-WEST ZONE.—**Rocas Porto Real, Bella Vista, Mont'Alegre, and Nova Cuba.**—Population, 1,337. Persons examined 1,094, showing trypanosomes in 39, filaria in 162, and malaria parasites in 84. Animals examined, 76, showing trypanosomes in 21 and filaria in 1. Besides 39 fresh cases of sleeping sickness to be found in this zone, there are 100 old cases, giving a total of 139. The percentage of fresh cases to persons examined is 3.5 per cent., and of total cases to population 10.3 per cent.

SOUTHERN ZONE.—**Rocas Terreiro Velho, Nova Estrella, Santo Christo, Abbade, S. Joao, and Infante D. Henrique.**—Population, 1,315. Persons examined, 742, showing trypanosomes in 14, filaria in 98, and malaria parasites in 75. Animals examined, 56, showing trypano- in 5. In this zone, besides 14 fresh cases, there are 5 old, giving a total of 19. The percentage of fresh cases to persons examined is 1.8, and of total cases to population, 1.5 per cent.

Cidade (Town Area).—Population (Europeans, natives, *serviçaes*, and establishment of brigade), 847. Persons examined, 847, 12 of whom showed trypanosomes, 144 filaria, and 46 malaria parasites. Animals examined, arrived from the south, 12, of whom 6 showed trypanosomes. Persons attacked, 20, fresh cases and old together. Percentage of fresh cases to persons examined, 1.4 per cent., and of all cases to population, 2.3 per cent.

It will be seen from the condensed description of the zones and from Table B, that the Northern Zone is the worst infected, after it the East-and-West, then the North-east, the Southern, and lastly the Cidade; the percentages of fresh cases to persons examined being respectively 5.4, 3.5, 3.3, 1.8, and 1.4 per cent. Considering the total percentage of persons attacked to population of each zone, we find the Southern Zone last on the list, which is not to be surprised at, for the *Roca Infante D. Henrique* has neither glossinas nor cases of sleeping sickness, except in persons who have contracted the disease in infected regions. It is noted that

the percentage of persons attacked is 17.1 in the Northern Zone, 10.3 in the East and West, 7.3 in the North-East, 2.3 in the Cidade, and 1.5 in the Southern.

Comparing the present percentages of persons infected with trypanosomes with those of 1908 (Corrêa Mendes Mission), we see that there is an enormous diminution of cases attacked, a matter which Form A makes clear.

FORM A.

Zones of the Island.	Percentage of human trypanosomiasis cases Corrêa Mendes (1908)	Percentage of persons infected during period of 10 months (Bruto da Costa 1912-13).	Percentage of trypanosomiasis cases now on the island of Principe (1913).
	per cent.	per cent.	per cent.
Northern	45.8	5.4	17.1
East and West . . .	20.0	3.5	10.3
North-east	25.8	3.3	7.3
South	12.7	1.8	1.5
Cidade	1.4	2.3

From this table it is to be seen how much diminished at the present moment are the cases of sleeping sickness, and they would now be insignificant, had the inhabitants and the Government in 1908 given serious thought to the fighting of the scourge which has victimised hundreds of persons. The percentages of persons infected with filariasis and paludism may be seen from Form B. which serves for comparison with the figures of 1908.

FORM B.

Zones of the Island.	Percentage of persons infected with paludism in 1908.	Percentage of persons infected with paludism in 1912-13.	Percentage of persons infected with filariasis in 1908.	Percentage of persons infected with filariasis in 1912-13.
	per cent.	per cent.	per cent.	per cent.
Northern	10.9	4.8	16.4	3.3
East and West . .	12.0	7.4	40.0	15.0
North-east	23.1	8.9	18.4	5.0
Southern	5.5	10.1	34.9	11.7
Cidade	5.4	...	17.0

It will be seen from the foregoing that the cases of filariosis and of paludism are now fewer in number, and that they do not retain the same relative proportions they had in 1908, for paludism used to rage with the greatest intensity in the Southern Zone, next in the North-East and the East and West; while filariosis used to prevail in the town area (*Cidade*), being less in the East and West, and least of all in the Southern.

In 1908, when we formed part of the Corrêa Mendes Mission, we used to hold that the native race of the island was inclined to disappear, for we reckoned that in 1900 the approximate number of that population was 800, and that in 1908 it was reduced to some 300 individuals. If the calculation we then made was not far from the truth, we are now in a position to state that the native population tends to increase, seeing that we have analysed the blood of no less than 550, of whom 430 are adults (189 men and 241 women) and 120 children (61 boys, 59 girls). What is actually the case with the natives would hold good of the *serviçaes* likewise, were these not a fluctuating population whose maximum stay is one of two years.

We are convinced that these excellent results in increased population are due to the sanitary operations to which all are now devoting attention.

Inefficacy of Atoxyl as a Prophylactic upon Animals attacked by Trypanosomes in the Island of Principe.

Following the parallel suggested by what is being done by means of arsenical preparations in cases of Nagana, Surra, etc., we have undertaken experiments with atoxyl in the form of hypodermic injection in order to watch its effect upon the trypanosomes of the animals in the island of Principe. When we belonged to the Corrêa Mendes Mission in the island in 1907-8, we made a careful study with a view to the recognition of the species of trypanosome observed by us in different animals, and, after a variety of attempts, we came to the conclusion that they must belong to one of

the species *Pecaudi* or *Dimorphon*; but to-day, after the latest work of Bruce upon the evolution of the trypanosome according to the animal host in which it lives, from the marked diminution of fresh cases of sleeping sickness in this island, after the segregation of all domestic mammiferous animals attacked and the slaughter of wild mammals, we are convinced that the divers forms and sizes of the parasite, and the position of the macronucleus and micronucleus in relation to the anterior and posterior extremities, which we observed in the blood of the animals, are probably nothing more than different modalities of the trypanosome Dutton-Castellani, according to the organic animal medium in which the parasites live.

Whether our assertions regarding the trypanosome which has invaded the organism of the animals (oxen, asses, mules, goats, horses, dogs, etc.), be true or hypothetical, we can, nevertheless, affirm that the propagation of the disease used to be effected on a large scale by means of the animals attacked, which wandered at liberty. For, as soon as these were segregated, or at least five or six months after, fresh cases of the disease became rare. We analysed the blood of domestic animals to the number of 206, finding trypanosomes in 40 cases, which gives a percentage of 19; and, as the segregation of some of these animals entailed serious loss to agriculture, we wished to try the effect of injections of atoxyl towards causing the disappearance of trypanosomes from the peripheral blood of the beasts, so as to allow of their working freely without risking any propagation of the disease we were engaged in combating.

For the experiment we chose 19 attacked animals, 7 being mules, 8 oxen, 2 horses, and 2 asses; but, unfortunately, we did not get satisfactory results, as the parasite was still observable despite the very high doses of atoxyl injected into the animals. Atoxyl applied to animals makes them strong and vigorous; but, if the trypanosomes disappear twelve hours after the injection, they reappear at the end of thirty-six or forty-eight hours. We began by treating the animals with 6 grammes of atoxyl dissolved in 25 to 30 c.c. of sterilised water in a double injection and

with an interval of forty-eight hours, given once in ten days; but, as the trypanosomes did not disappear, the dose was raised successively to 10 grammes, that is to say, 20 grammes were given with intervals of forty-eight hours; but, nevertheless, the results were *nil*, as may be seen from the cases we are about to detail so as to support the inferences we shall draw from our experimental observations.

Description of the Cases Serving for Experiment.

Case I.—Mule “Mairani,” of *Rocha Porto Real*, arrived from Lisbon, April 1912. Blood examined 15th August of the same year; result: some trypanosomes. On the 26th August treatment was begun by double injection of 6 grammes of atoxyl every ten days, and thus the mule took 12 grammes of atoxyl on the 25th and 27th. Its blood was examined on the 28th August: negative result; on the 29th, positive. A fresh quantity of blood was drawn on the 4th September, at different times, that is to say in the morning and at mid-day, trypanosomes being visible only in that taken at mid-day. *Treatment*:—On the 6th and 8th of September, 12 grammes of atoxyl; on the 18th and 20th of September, 12 grammes. Analysis of the blood, 30th September: some trypanosomes. As the 6-gramme dose did not give results, 8 grammes were administered under the same conditions, and thus the treatment was: on the 2nd and 4th October, 16 grammes of atoxyl; on the 15th and 17th of the same month, 16 grammes. Analysis of 8th November: some trypanosomes.

The dose was then increased from 8 to 10 grammes. *Treatment*:—On the 9th and 11th November, 20 grammes; on the 21st and 23rd, 20 grammes. Analysis of the blood (drawn at 11 a.m.) 26th, negative; at 6 p.m. of the same day the result was positive. Fresh analysis made 3rd December, “a few trypanosomes.” *Treatment*: On the 27th and 29th December, 20 grammes; on the 8th and 10th January, 20 grammes; on the 20th January, 20 grammes; on the 20th and 22nd January, 20 grammes. Analysis of the blood, 25th January, “a few trypanosomes.” The mule

"Mairani" presented, after the first injections of atoxyl, the appearance of a healthy animal, and at the end of the treatment seemed still stronger and more vigorous, but unfortunately it had to be condemned to death on the 20th February, as the trypanosomes has not disappeared from the circulation.

Summary of Case.—The mule "Mairani" took 224 grammes of atoxyl within a period of 5 months, yet the parasites did not disappear from the peripheral blood except for a few hours after the injections. The atoxyl rendered it strong and vigorous, and notwithstanding the large dose it had, it showed no signs of intolerance.

Case II.—Ox "Martello" of the *Rocha Porto Real*, brought from Angola, showed in its blood "some trypanosomes" on the 30th August. *Treatment*: on the 3rd and 5th September, 8 grammes of atoxyl in 40 cubic centimetres of distilled water to each injection (total, 16 grammes); on the 15th and 17th September, 16 grammes; on the 27th and 29th, 16 grammes. Analysis of blood 1st October, from a preparation taken at 11 A.M., positive; from blood of 6 P.M., negative; on the 2nd October, "some trypanosomes." *Treatment*: on the 2nd and 4th October, 20 grammes. Analysis of blood on the 6th October, "a few trypanosomes." The ox was slaughtered on the 8th October on account of its showing signs of blindness and weakness of the limbs (hind legs) which came on after the second injection of atoxyl given 4th October, to such an extent as to make it unable to stand. We made *frottis* of the different viscera of the ox, but the microscopic examinations were all negative. The spleen weighed 700 grammes and the aspect of the viscera was normal.

Summary of Case.—The ox "Martello" took 68 grammes of atoxyl in one month and some days, yet the trypanosomes never disappeared from the peripheral blood. It was killed because of the perturbations it presented, following the second injection.

Case III.—Ox “Candeia” of *Roça Porto Real*, arrived from Lisbon about a year before, showed “some trypanosomes” on the 30th August 1912. *Treatment*: on the 3rd and 5th September, grammes 16; on the 15th and 17th grammes 16; on the 27th and 29th, grammes 16. Blood analysed 1st October, “some trypanosomes.” *Treatment*: on 2nd and 4th October, 20 grammes; on the 15th and 17th, 20 grammes; on the 27th and 29th, 20 grammes. Analysis of blood on 3rd November, negative, and on 5th idem “a few trypanosomes.” *Treatment*: on the 9th and 11th November, 20 grammes; on the 21st and 23rd, 20 grammes. Analysis of blood, 1st December, negative. *Treatment*: on 3rd and 5th December, 20 grammes. Analysis of blood, 7th December, preparations made at 8 A.M., negative; preparations made at 4 P.M., positive. *Treatment*: on the 15th and 17th December, 20 grammes; on the 27th and 29th, 20 grammes. Analysis of blood, 3rd January, “a few trypanosomes.” The animal was killed on the 18th January, as the parasites had not disappeared. This ox always kept its good appearance, and did not display any of the perturbations that ox “Martello” did, although it had taken a larger dose of atoxyl. An autopsy was made, but in the *frottis* of the various viscera trypanosomes were not observed. The aspect of the viscera was normal, and the spleen weighed 650 grammes.

Summary of Case.—The ox “Candeia” took 208 grammes of atoxyl in the space of four months, yet the trypanosomes did not disappear from the peripheral blood. It did not show signs of blindness nor weakness of the posterial members as did the preceding animal, although it had taken atoxyl in a larger dose.

Case IV.—Ox “Pinto,” of the *Roça Sundy*, brought from Cabo Verde, showed trypanosomes on 23rd September, 1912. *Treatment*: on the 25th and 27th of September, 12 grammes; on the 6th and 8th October, 12 grammes; on the 18th and 20th, 12 grammes; on the 10th and 12th November, 12 grammes; on the 22nd and 24th, 12 grammes.

Analysis of blood, 27th November, "a few trypanosomes."
Treatment: 1st and 3rd December, 16 grammes; 13th and 15th, 16 grammes; 25th and 27th, 16 grammes. Examination of blood, 30th December, "a few trypanosomes."
Treatment: 6th and 8th January, 20 grammes; 21st and 23rd January, 20 grammes. Examination of blood 28th January: "a few trypanosomes." This ox always maintained its usual appearance, and after treatment seemed stronger. It did not show visual perturbations, and was worked at night, when there was a moon, so as not to interfere with the duties of the estate.

Summary of Case.—The ox "Pinto" took 160 grammes of atoxyl in a period of four months, and the trypanosomes did not disappear from the peripheral blood. It showed no signs of poisoning.

Case V.—Ox "Pirideu," of the *Roça Sundy*, brought from Cabo Verde, showed trypanosomes on the 23rd September. It was treated on the same days and in the same manner as the preceding ox.

Summary of Case.—This ox "Pirideu" took 160 grammes of atoxyl in a period of four months, and the trypanosomes did not disappear from its blood. It showed no signs of poisoning.

Case VI.—Ox "Ignez" of the *Roça Sundy*, brought from Cabo Verde, showed trypanosomes on the 23rd September. It was dealt with, as regards analysis and treatment, precisely as in the two preceding cases, and with identical results.

Summary of Case.—The same as above.

Case VII.—Ox "Pomba," of *Roça Sundy*, brought from Cabo Verde. When its blood was analysed, on the same occasion as that of the other oxen of this estate, the result was positive. Treatment and analysis of blood were given on the same dates, and the results of the experiment were exactly the same as those upon the three oxen above mentioned, of the same estate.

Summary of Case.—The ox “Pomba” took 160 grammes of atoxyl, but the trypanosomes did not disappear from its blood. It showed no signs of blindness, nor of weakness of the posterior limbs.

Case VIII.—The ox “Palavra,” of *Roça Sundry*, brought from Cabo Verde. This animal was treated as was the ox “Pinto,” but on the 12th January, began to show signs of enfeeblement. On the 21st January it died, after an injection of 10 grammes of atoxyl.

Summary of Case.—Ox “Palavra” took 140 grammes of atoxyl, but its trypanosomes did not disappear from the blood. It died following an injection.

Case IX.—Ox “Grande,” of the *Roça Terreiro Velho*, brought from Angola, showed trypanosomes on the 4th September 1912. *Treatment*: On 6th September, a simple injection of 8 grammes of atoxyl; on 16th and 26th September and 6th October, 8 grammes of atoxyl each time; on the 9th October its blood was examined, and showed a greater number of trypanosomes than on the first occasion. As simple injections had done no good, we began to give double ones, with the same dose of atoxyl to each, and this treatment lasted for a month without result, for after 48 grammes of atoxyl the trypanosomes had not gone. From 25th November to 25th December another dose of 48 grammes of atoxyl was administered, yet trypanosomes continued to be observed in the blood. The 48-gramme dose was kept up from 25th December to 24th January, and the analysis made on 2nd February did not reveal trypanosomes: but, eight days after a fresh double injection of 8 grammes, parasites were again seen in the blood of the animal. It was slaughtered on the 28th February 1913, though it had every appearance of a healthy animal.

Summary of Case.—Ox “Grande” took 184 grammes of atoxyl in a period of five months, but the trypanosomes did not disappear from its peripheral blood. The animal always maintained a good appearance.

Case X.—Horse “Branco,” of the *Roça Terreiro Velho*, brought from Lisbon two years before, showed trypanosomes on the 4th September. It was treated as in the preceding case, but the treatment was prolonged into the middle of March. The analyses of its blood were always positive, but after taking 120 grammes of atoxyl the examination of the preparation was negative; on continuing the treatment, and after eight days had elapsed from a fresh double injection, the examination revealed a fresh positive result. The animal always preserved the best possible aspect, and after it had been given 264 grammes of atoxyl within a period of six months, without causing the disappearance of the trypanosomes, the injections were suspended to allow of its being slaughtered on a suitable occasion.

Summary of Case.—This horse took 264 grammes of atoxyl in the space of six months, and the trypanosomes never disappeared from the peripheral blood except temporarily. It always looked healthy, and was only killed after further experiments, the results of which were identical with those preceding.

Case XI.—Mule “Andorinha,” of the *Roça Terreiro Velho*, brought from Lisbon two years before. Examination of the blood, 4th September 1912, gave a positive result. This mule was treated by the same processes as in the two preceding cases. After it had taken 72 grammes of atoxyl, the analysis of the blood gave a negative result, but continuance of the treatment by double injections showed trypanosomes in some of the preparations of blood made on the same day but at different hours. After the treatment had been continued, till in three months 120 grammes of atoxyl had been injected, it presented visual perturbations and enfeeblement of the posterior limbs, dying 23rd December 1912.

Summary of Case.—The mule “Andorinha” took 120 grammes of atoxyl in a period of three months, but

always showed trypanosomes in the peripheral blood. It died 23rd December, after showing signs of blindness and weakening of the posterior limbs.

Case XII.—Mule “Da-Mão,” of the *Roça Bella Vista*, brought from Lisbon in July 1912, showed trypanosomes on the 2nd September. It was treated with simple injections of 8 grammes of atoxyl every ten days. After ten days of this treatment, seeing that the blood analysis continued to show trypanosomes, this animal was given double injections. In spite of its having taken 192 grammes of atoxyl, the trypanosomes did not disappear from the peripheral blood, and blindness was almost complete when the treatment was ordered to be suspended. The general condition of the animal is good, but although the treatment has been suspended, the visual perturbations exist.

Summary of Case.—The mule, “Da-Mão” took 192 grammes of atoxyl in a space of six months, yet the parasite did not disappear from the peripheral blood. Except for the visual perturbation, the animal shows no sign of ill health.

Case XIII.—Mule “De Sella,” of the *Roça Bella Vista*, brought from Lisbon, July 1912. Showed trypanosomes, 6th November. Was at once treated with double injections of 8 grammes of atoxyl every ten days. At various times during treatment its blood was analysed, and always showed trypanosomes, which persisted even after 140 grammes had been administered. It showed no sign of visual or other disturbance. The general health of the animal is excellent.

Summary of Case.—The mule “De Sella” took 144 grammes of atoxyl in a period of four months, but trypanosomes were always present in the blood. It showed no visual disturbance.

Case XIV.—Mule “Cacoco Leste,” of the *Roça Porto Real*, brought from Lisbon about a year before. Showed

trypanosomes 16th January 1913. *Treatment*: double injection of 10 grammes of atoxyl given every ten days; on 18th and 20th January, 20 grammes; on 30th January and 1st February, 20 grammes; on 11th and 13th February, 20 grammes; on 23rd and 25th February, 20 grammes. Blood examined 4th March: "some trypanosomes." On the 7th and 9th March, 20 grammes; on the 19th and 21st, 20 grammes; on the 31st and 2nd April, 20 grammes. Examined 7th April: "some trypanosomes." Died 8th April 1913.

Summary of Case.—Mule "Cacoco Leste" took 140 grammes of atoxyl in a period of two months and some days, but the trypanosomes never disappeared from its blood. It did not present symptoms of blindness, nor enfeeblement of the posterior limbs.

Case XV.—Mule "Cacoco Oeste" of the *Roça Porto Real*, brought from Lisbon about a year ago. Showed trypanosomes on the 30th January 1913. It was given double injections of 10 grammes of atoxyl every ten days. On the 2nd and 4th February it took 20 grammes; on the 14th and 16th, 20 grammes. Its blood, examined 4th March, showed "some trypanosomes." Treated 10th and 12th March, 20 grammes; 22nd and 24th, 20 grammes; and finally, on 3rd and 5th April, 20 grammes more. Examination of blood, 14th April: "a few trypanosomes." Died 26th April.

Summary of Case.—The mule, "Cacoco Oeste," took 120 grammes of atoxyl; but the trypanosomes did not disappear from the blood. It showed no symptoms of blindness, nor of enfeeblement of the posterior members.

Case XVI.—Mule "Cachucha," of the *Roça Nova Estrella*, brought from Cabo Verde some years ago. It showed trypanosomes on the 7th September. *Treatment*: simple injections of 5 grammes of atoxyl every ten days. At the end of a month's treatment, its blood was analysed

and gave negative results. The treatment was continued, and the analyses were invariably negative; but on the 15th March blood was taken at three different hours of the day, and that taken at 8 A.M. showed a positive result. Later on, it was treated with double injections of 6 grammes of atoxyl every ten days; but the trypanosomes did not disappear, although it had taken 48 grammes of atoxyl in the period of one-and-a-half months of the later treatment. The mule was killed, as being unfit for further service on the estate.

Summary of Case.—Mule “Cachucha” took, to begin with, simple injections of 5 grammes, and afterwards double injections during a period of a month and a half; yet the trypanosomes did not disappear from the peripheral blood. There were negative as well as positive results on analysis, despite the treatment persisted in.

Case XVII.—Horse “Maluco,” belonging to one of the doctors of the Mission, brought from Dakar, showed trypanosomes on the 5th October 1912. It was isolated, and treated with injections (double) of 10 grammes of atoxyl for two months; but, as it showed signs of enfeeblement of the hind legs, the dose of atoxyl was reduced to 6 grammes. As the trypanosomes did not disappear notwithstanding this prolonged treatment, it was ordered to be killed in February of this year.

Summary of Case.—The horse, “Maluco,” took 220 grammes of atoxyl, yet the trypanosomes did not disappear from the blood. It was killed because it could not be made use of during the daytime.

Case XVIII.—Ass, of the *Roça Santo Christo*, treated with 1 gramme of atoxyl in double injections every ten days for two months, showed invariably positive results. The ass thus attacked was slaughtered because the factor of the property had “something else to do than pump atoxyl into animals.”

Case XIX.—Ass, of *Roca Sant'Anna*, showed "many trypanosomes" on the 2nd March. It was treated with double injections of 4 grammes of atoxyl; but, unfortunately, the animal, at the second injection, showed symptoms of enfeeblement of the posterior limbs to such a degree as not to be able to stand up. The manager of the estate, after asking leave to do so, ordered it to be slaughtered.

A reading of these nineteen cases will show that atoxyl as a tonic produces some results; but, employed as a means of prophylaxis against the propagation of sleeping sickness, it is of no value, seeing that, in all these cases, the trypanosomes never disappeared from the peripheral blood; and if by any chance they were not detected in rare cases, it was because the blood for examination had not been taken at different hours of the same day. In the majority of cases, the animals injected with atoxyl seemed stronger and more vigorous, in spite of being carriers of trypanosomes just as the beginning of the treatment. We also noted that atoxyl is only useful to prolong the life of the animals attacked. It may be asked how atoxyl prolongs the life of the animals without destroying the parasite. We would reply that it tones up the organism and thus gives it greater resisting power, for it is only thus that the cases of spontaneous cure of trypanosomiasis can be explained.

In some cases, the animals treated showed signs of blindness and enfeeblement of the posterior members, as happened in the following cases: No. 2, after 68 grammes of atoxyl spread over a period of a month and a half; No. 8, after 140 grammes of atoxyl in five months; No. 11, after 120 grammes in a period of three months; and, lastly, No. 12, after 192 grammes in a period of six months. Should we consider the symptoms of blindness and enfeeblement of the posterior limbs as resulting from the poisonous properties of the medicament or from the disease itself? We cannot answer categorically one way or the other, as we have not had the time required for research in this direction. It seems to us, however, that such perturbations are symptoms of the disease rather than of poisoning, not merely because in cases Nos. 1, 3, 4, 5, 6, 7, 10, 14, and 15, in which atoxyl

injections were given throughout a period of from four to six months, to the extent of 224 grammes, 208 grammes, 160 grammes, 184 grammes, 264 grammes, 140 grammes, and 120 grammes, there were no signs of perturbation such as the other animals showed with smaller doses; but also because we observed similar cases in the animals not treated. If we incline rather to the view that the perturbations remarked in the animals may be symptoms of the disease, it is because we have met with parallel cases in human beings, for, in two *serviçaes* who complained of general debility and blindness, their blood containing trypanosomes, after a month's treatment with double injections of 6 décigrammes of atoxyl, we found a marked improvement in these perturbations. We also had two other individuals under observation, two being sufferers from sleeping sickness, whose treatment with injections of atoxyl had been suspended because they showed visual perturbation; when these were admitted into the military hospital, they were treated with the same medicament, but, so far from this prejudicing their vision, it benefited them sensibly in this respect during the month and a half of its continuance; which leads us to hold that in the case of animals, the same should occur. Thus the perturbations observed by us during the treatment of certain cases of animal trypanosomiasis must have been the sequelæ of the disease itself, and we should not attribute them to intolerance of the drug.

During the long period of treatment of the animals attacked we made many analyses of their blood, some twenty-four hours after the atoxyl injection, others after forty-eight hours, and lastly, in the majority of cases, after four, five, and nine days from date of injection. From the results which we obtained, we would say that the presence of trypanosomes in most instances shows itself forty-eight hours after the injection, and the parasite never disappears from the blood except at certain hours of the day, for in the course of the analyses made by us we have noted that if the preparations made at 11 A.M. are negative, those of 6 P.M. are positive, and *vice-versa*.

We have read elsewhere that animals attacked with trypanosomiasis are curable at the beginning of their attack, as is the case with human beings ; but we would here record it that it is difficult to state, when the trypanosome is found in the peripheral blood of the animal, mule, ox, ass, etc., whether the disease is incipient or in its first period. We regard such an opinion as hazardous and not very practical for purposes of sanitation.

We know another view as well, that of an intelligent medical man, it is true, but one who lives in a medium of scientific theory too adaptable, accepted by some planters, to the effect that in the mules of Cabo Verde and in the asses attacked, the trypanosomes disappear from the peripheral blood when treated with atoxyl. We unfortunately have not found this so in the course of our experiments, for in the case of the mule "Cachucha," of the *Roça Nova Estrella*, born in Cabo Verda, in spite of a very high dose of atoxyl, the parasites never left the blood. As for the asses, we cannot declare peremptorily that the trypanosome does not disappear from their peripheral blood, for we have been unable to experiment as we had hoped to do, but we incline to the belief that what happens is the same as in the case of the other animals, in which atoxyl has no prophylactic value whatever.

We would advise anyone desirous of carrying out conscientious studies of the effect of atoxyl as a prophylactic upon animals to make at least three examinations of the blood, at different hours of the day and several times repeated, so as to have a relative certainty as to whether the animal is suffering or not and whether the trypanosomes have disappeared from its peripheral blood. Thinking at first that atoxyl in injection administered preventively to the animal would ward off the attack, we had recommended the planters to give this drug every month in doses of 5 to 8 grammes, but now we are convinced of the uselessness of such injections as a prophylactic unless it be immediately after the fly has stung the animal, a measure practically impossible.

In Conclusion.—1st: Atoxyl has no value whatever when employed as a prophylactic upon animals.

2nd: Atoxyl does not prevent the multiplication of the parasites in the blood of the animals, no matter how high the dose, except temporarily.

3rd: Atoxyl is only useful as a tonic, rendering the animals strong and vigorous, and prolonging their life.

4th: We should not conclude that an animal is not suffering, simply on the strength of an analysis of a preparation made at any hour of the day; blood samples must be taken at different hours and at varying times, and only when all the preparations prove negative can we confirm our doubt that the animal is a carrier of trypanosomes.

5th: Recognising from experience that atoxyl does not cause the disappearance of the trypanosome from the animal, the latter should be killed as soon as the existence of the parasite is verified, so as to prevent the spread of sleeping sickness.

Date for Statistics upon Mortality and Sleeping Sickness in Principe.

In October 1912, we submitted a report upon the statistical work of this island, in order to observe better the result of the execution of the prophylactic measures against the spread of sleeping sickness and of sanitation in general; and now we take advantage of the ten months of our stay here to verify the mortality of the island since the 1st August 1912 up to the end of May 1913. The present data are the closest possible to the truth, for we now know almost for certain the number of natives (born in the island), which we could not previously ascertain for absolute want of time. Before going into statistical matters, let us explain that the percentages relate to the number of deaths that have taken place within the ten months; but anyone anxious to ascertain the percentage for the twelve months of general mortality can easily work it out for himself. To establish a certain harmony with the

statistical work that we did some years back, we shall divide the island of Principe into five zones: northern, north-east, east and west, south, and *cidade* or town area. As we desire that the planters should be acquainted with the mortality that each has upon his plantation, in the tables showing the zones we shall present to the reader not only the percentages of general mortality and of sleeping sickness in relation to population, but also those of sleeping sickness to general mortality. With this end in view we shall start by drawing up Table A., referring to the northern region of the island.

From this Table we shall see that the percentage of general mortality is highest in the *Roça Sundy*, next in *Ribeira Izé*, *Santa Ritta*, *Aguiem*, and lastly in *Bombom*. The percentage of sleeping sickness to population has been greatest in the properties of *Sundy*, *Aguiem*, and *Santa Ritta*; and that of sleeping sickness to general mortality in *Aguiem*, *Santa Ritta*, and *Sundy*.

TABLE A.

Estates.	Mean total population.	General Mortality.	Deaths from sleeping sickness.	Percentage to general mortality.	Percentage of sleeping sickness to population.	Percentage of sleeping sickness to general mortality.	Percentages of Northern Zone.		
							Percentage of general mortality.	Percentage of sleeping sickness to population.	Percentage of sleeping sickness to general mortality.
Sundy .	595	62	38	10.3	6.3	61.2			
Ribeira Izé	70	4	0	5.7	0.	0.			
Bombom .	66	2	0	3.0	0.	0.			
Santa Ritta	80	3	2	3.7	2.2	66.6			
Cascalheira	40	2	0	5.0	0.	0.			
Aguiem .	29	1	1	3.4	3.4	100.			
	880	74	41				8.8	4.6	55.4

In this Table we give not merely the number of deaths of adults, but also of children, thus raising the percentage for the *roças* where infantile mortality is high, and as it is necessary that those most concerned should note and discriminate clearly, we shall give separately the adult establishments and their mortality in Table A¹.

TABLE A¹.

Estates.	Adult Pop- ulation.	Total Adult Mortality.	Percentage of General Mortality.	Percentage of Adult Deaths Northern Zone.
Sundy	516	46	8.8	6.7
Ribeira Izé	68	2	2.9	
Bombom	64	2	3.1	
Santa Ritta	72	2	2.7	
Cascalheira	38	1	2.9	
Aguiem	25	1	4.0	
	783	54		

Comparing Tables A and A¹, we see that in the *Roça Sundy* sixteen children died, which is heavy in relation to the total number of deaths. What has happened in this *roça* is to be noted also in *Roças Ribeira Izé*, *Santa Ritta*, and *Cascalheira*, showing clearly how necessary it is to take the greatest care with the children.

In Table A² it is to be seen that there has been a sensible improvement in the general mortality of the properties composing the Northern Zone.

TABLE A².

Northern Zone Estates.	1909.		1910.		1911-12		1912-13	
	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.
Sundy . . .	17.7	40.8	17.7	60.5	15.3	71.9	10.4	61.2
Ribeira Izé . .	14.7	46.9	14.6	83.3	25.0	66.6	5.7	0.
Bombom . . .	7.5	33.3	8.1	0.	3.3	0.	3.	0.
Santa Ritta . .	17.6	87.5	5.5	33.3	29.7	64.2	3.7	66.6
Cascalheira . .	12.5	50.0	41.6	60.0	(a)		5.	0.
Aguiem . . .	21.8	19.3	18.1	50.0	10.7	33.3	3.4	100.

(a) This indicates that there were no workers on the estate.

From this Table it will be seen that the percentages of mortality in 1912-13 fell surprisingly, and principally on the *Roças Santa Ritta* and *Ribeira Izé*, which may be partially explained by the labouring establishments having been recently acquired. The percentage of sleeping sickness to general mortality has not undergone much alteration, which is not to be wondered at, for the sufferers from it, old cases for the most part, not being repatriable for this reason, must necessarily add to the number of deaths.

In Table A³, we see what diseases produce the greatest number of deaths in each *roça* of the Northern Zone.

TABLE A³.

Estates.	Sleeping sickness.	Congenital debility.	Tetanus.	Malarial Anemia.
Sundy . .	38	5	5	0
Ribeira Izé .	0	1	1	0
Bombom .	0	0	0	1
Santa Ritt .	2	1	0	0
Cascalheira .	0	1	0	0
Aguiem . .	1	0	0	0
	41	8	6	1

It will be seen that, according to this Table, the diseases, after sleeping sickness, which caused the most deaths were congenital debility and tetanus, which implies that the children gave quite an appreciable contingent towards the mortality.

Let us now go on to look at Table B, relating to the North-eastern Zone, the population of which is 559 souls, and in which 31 deaths have been registered, including those from sleeping sickness, as will be seen from the statement following:

TABLE B.

Estates.	Mean total population.	General mortality.	Deaths from sleeping sickness.	Percentage to general mortality.	Percentage of sleeping sickness to population.	Percentage of sleeping sickness to general mortality.	Percentages of N.E. Zone.		
							General Mortality.	Sleeping sickness to population.	Sleeping sickness to general mortality.
Praia Inhame	140	5	3	3·5	2·1	60			
Sant'Anna .	89	5	5	5·6	5·6	100			
Bellomonte .	113	13	0	11·5	0·	0			
Paciencia .	159	5	4	3·1	2·5	80			
Futuro .	27	2	0	7·4	0·	0			
Saudade .	31	1	0	3·2	0·	0			
	559	31	12				5·5	2·1	38·7

In the *Roças* of the North-eastern Zone it will be seen that the percentages of general mortality are greatest in the *Roças Bellomonte* and *Futuro*, which is explainable by the enormous number of infantile deaths, as is to be seen by a comparison of Table B with Table B¹.

TABLE B.¹

Estates.	Adult Population.	Total adult mortality.	Percentage to general mortality.	Percentage of adult deaths in N.E. Zone
Praia Inhame	126	4	3.1	3.5
Sant'Anna .	82	5	5.6	
Bellomonte .	106	3	2.7	
Paciencia .	143	5	3.1	
Futuro .	27	0	0.	
Saudade .	29	1	3.2	
	503	18		

From the perusal of the latter table along with the former, it appears that on the *Roças Bellomonte*, out of a total of 13 deaths, 10 were of children, which is excessive. This estate ought to redouble its care and attention towards the new-born and the children. What applies to *Bellomonte* applies equally to *Futuro*.

In Table B² we shall present the mortality percentages of different years.

Comparing the percentages of the last ten months with the preceding years we see that *Bellomonte* alone shows a higher percentage for the years 1912-1913. In the other properties of the same zone, the rate has fallen greatly, especially in the *Roça Praia Inhame* and in *Paciencia*. The reason for the rise in the case of *Bellomonte* has been stated above. The percentages of sleeping sickness to general mortality in most cases have increased for much the same reasons as those given respecting the Northern Zone.

TABLE B²

Estates.	1909.		1910.		1911-12.		1912-13.	
	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.
Praia Inhame	28·1	29·6	11·5	21·4	12·5	56·5	3·5	60
Sant' Anna .	13·3	0·	2·5	50·	8·7	71·4	5·6	100
Bellomonte .	8·6	12·5	7·8	0·	8·8	20·	11·5	0
Paciencia .	10·	12·5	5·1	14·2	8·8	45·3	3·1	80
Futuro .	3·3	100·	8·5	50·	8·8	40·	7·4	0
Saudade .	10·	25·	1·5	50·	5·	0·	3·2	0

The diseases which have caused the greatest number of deaths in the N.E. Zone are shown in Table B³.

TABLE B³

Estates.	Sleeping Sickness.	Congenital Debility.	Tetanus.	Diarrhoea.	Peritonitis.
Praia Inhame .	3	0	0	0	0
Sant' Anna .	5	0	0	0	0
Bellomonte .	0	6	2	0	0
Paciencia .	4	0	0	0	0
Futuro .	0	1	0	1	0
Saudade .	0	0	2	0	1
	12	7	1	1	1

It will also be observed from this Table that the greatest number of deaths, after sleeping sickness, was caused by

congenital debility and tetanus, these diseases predominating in *Roças Bellomonte* and *Futuro*.

The East and West Zone, which used formerly to show an enormous mortality, due to deaths on the *Roça Porto Real*, now that the mortality of that *roça* has fallen marvellously, shows a great diminution in the percentage of mortality of the zone, as may be seen from Table C.

TABLE C.

Estates.	Mean Total Population.	General Mortality.	Deaths from sleeping sickness.	Percentage to general mortality.	Percentage of sleeping sickness to population.	Percentage of sleeping sickness to general mortality.	Percentages E-W. Zone.		
							General mortality.	Sleeping sickness to population.	Sleeping sickness to general mortality.
Porto Real	1078	67	33	6.2	3.0	49.2			
Bella Vista	154	8	1	5.1	0.6	12.5			
Mont'Alegre	66	3	2	4.5	3.0	66.6			
Nova Cuba	39	0	0	0.	0.	0.			
	1149	78	36				5.8	2.6	46.1

From Table C. it will be seen that the percentage of general mortality of *Roça Porto Real* is 6.2 per cent. and of sleeping sickness to population 3 per cent. This percentage is still higher than that of the other estates in the same zone, but it is insignificant nevertheless. We also see from the Table that the percentage of sleeping sickness to general mortality is higher in *Roça Mont'Alegre* than in *Porto Real* or *Bella Vista*. The amount of infantile mortality has been relatively heavy in this zone, as is obvious by comparison of Tables C. and C¹.

TABLE C¹.

Estates.	Adult Pop- ulation.	Total adult mortality.	Percentage general mor- tality.	Percentage Adult Deaths E.-W. Zone.
Porto Real .	915	48	5.2	4.7
Bella Vista .	146	4	2.6	
Mont' Alegre .	51	2	3.9	
Nova Cuba .	37	0	0.	
	1149	54		

Studying this Table along with that preceding it, we see that there has been, relatively speaking, a greater number of deaths of children on *Bella Vista* than on *Porto Real*, but that in both roças infantile mortality has been heavy.

TABLE C².

E. and W. Zone. — Roças.	1909.		1910.		1911-12.		1912-13.	
	Percentage of gene- ral mortality.	Percentage of sleep- ing sickness to gene- ral mortality.	Percentage of gene- ral mortality.	Percentage of sleep- ing sickness to gene- ral mortality.	Percentage of gene- ral mortality.	Percentage of sleep- ing sickness to gene- ral mortality.	Percentage of gene- ral mortality.	Percentage of sleep- ing sickness to gene- ral mortality.
Porto Real .	17.1	9.5	11.9	35.9	15.1	48.3	6.2	49.2
Bella Vista .	17.5	46.1	10	12.9	7.4	40	5.1	12.5
Mont' Alegre .	7.6	0	7.4	50	4	50	3.0	66.6
Nova Cuba .	8.3	5	18.5	44.4	19.4	42.8	0	0

Comparing the percentages of previous years with those of the current year, we find a sensible diminution in general

mortality, as may be seen from Table C². From this Table it will be noted that formerly the *Roça Porto Real* which used to show a general mortality of 15 to 17 per cent., has now fallen to 6.2 per cent—a figure that would become 5.2 per cent., were it not for the infantile mortality. On the *Roça Bella Vista* the general mortality percentage would be still lower were the infantile mortality not included, for 5.1 per cent. would become 2.6—a very insignificant figure compared with that of the preceding years.

The maladies which caused the greatest number of deaths in the E. and W. Zone may be seen from Table C³.

TABLE C³.

Roças.	Sleeping sickness.	Anemia of ankylostomiasis.	Congenital debility.	Tetanus.
Porto Real . . .	33	12	4	4
Bella Vista . . .	1	0	3	0
Nova Cuba . . .	0	0	0	0
Mont'Alegre . . .	2	0	1	0
	36	12	8	4

From the above Table it will be seen that sleeping sickness caused most of the deaths: next came anemia of ankylostomiasis, and then congenital debility. Of that form of anemia children of from one to ten years died to a larger number than adults; thus we see that it is the children who furnish the largest contingent, after the sleeping sickness cases, to the obituary of this zone. Let us pass on to the Southern Zone, with a population of 1,315, and 43 deaths, of whom 7 were sleeping sickness patients, as will be seen from Table D.

TABLE D.

Estates.	Mean total population.	General Mortality.	Deaths from sleeping sickness,	Percentage to general mortality.	Percentage sleeping sickness to population.	Percentage sleeping sickness to general mortality.	Percentages South Zone.		
							General mortality.	Sleeping sickness to population.	Sleeping sickness to general mortality.
Terreiro Velho	267	10	2	3·7	0·7	20			
Nova Estrella	116	4	0	3·4	0·	0			
Santo Christo	99	9	4	9·0	4·0	44·4			
Abbad e . . .	151	4	0	2·6	0·	0			
Inf.D. Henrique	616	15	1	2·4	0·1	6·6			
S. João . . .	66	1	0	1·5	0·	0·			
	1315	43	7				3·1	0·5	17

It will be observed that the percentage of general mortality is relatively great in the *Rocha Santo Christo*, and that this is partly due to old cases of sleeping sickness. If we compare Table D. with D¹. we shall see that in the Southern Zone infantile mortality is relatively great.

TABLE D¹.

Estates.	Adult population.	Total Adult mortality.	Percentage general mortality.	Percentage Adult Deaths South Zone.
Terreiro Velho .	224	9	4·0	
Nova Estrella .	83	1	1·2	
Santo Christo .	80	7	8·7	
Abbade . . .	127	1	0·8	
Inf. D. Henrique	402	5	1·2	
S. João . . .	66	1	1·5	
	982	24		2·4

The highest infantile mortality in this zone was in the *Roças Abbade, Nova Estrella* and *Infante D. Henrique*. If we compare the percentages of different years, we shall find that the figure of general mortality has fallen considerably in all the roças and especially in *Santo Christo* and *Abbate*, in which the percentages for the years 1911-1912 were 17.9 and 9.1, whereas they are now 9 per cent. and 2.6 per cent., as may be seen from Table D².

TABLE D².

Estates.	1909.		1910.		1911-12.		1912-13.	
	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.
Terr. Velho .	11.6	8.5	18.9	30.3	5.8	15.3	3.7	20
Nova Estr. .	2.4	22.2	0	0	8	57	3.4	0
S. Christo .	14.	42.8	7.2	28.5	17.9	68.4	9	50
Abbate .	7.5	50	3.6	0	9.1	10	2.6	0
Inf. D. Henr. .	2.3	8.3	2.4	20	1.6	0	2.4	6.6
S. João .	(a)						1.5	0

(a) From 1909 up to 1911 this estate had no labourers of its own.

The diseases causing the largest number of deaths will be seen from Table D³.

TABLE D³.

Estates.	Sleeping sickness.	Congenital debility.	Intestinal parasites.	Diarrhoea.	Anemia of ankylos.	Pulmonary tuberculosis.
Terreiro Velho	2	0	0	0	0	2
Nova Estrella	0	1	1	0	0	0
Santo Christo	4	2	0	0	0	0
Abbade	0	2	0	0	1	0
Infante D. Henrique . .	1	0	3	4	0	0
S. João	0	0	0	0	1	0
	7	5	4	4	2	2

From this Table it will be seen that, after sleeping sickness, the diseases which caused the highest mortality, were congenital debility and intestinal parasites, which again means that the children gave a large contribution to the obituary of the zone.

We would observe, finally, that the *Cidade* Zone, including the natives of the island and their *serviçaes*, the Europeans, and the official sanitary brigade, is to be studied in Table E.

TABLE E.

Zone.	Mean total population.	General mortality.	Deaths from sleeping sickness.	Percentage to general mortality.	Percentage sleeping sickness to population.	Percentage sleeping sickness to general mortality.
Cidade	847	60	9	7	1	12

In this Table adult mortality and infantile mortality are shown together; but in Table E¹ adult mortality alone appears.

TABLE E¹.

Zone.	Adult Population.	Adult Mortality.	Percentage to General Mortality.
Cidade . . .	727	43	5.9

In this Zone, also, the infantile mortality is great, and this shows how general is the lack of care towards women in pregnancy and children. This neglect on the part of parents and guardians, aggravated as it is by the utter ignorance of hygiene among the *serviçaes* and natives, contributes to the high death-rate.

TABLE E².

Zone.	1909.		1910.		1911-12.		1912-13.	
	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.
Cidade . . .	34.7	27.3	29.8	15.4	25	15	7	12

In the above Table E², the enormous fall in the death-rate compared with previous years, shows how much improved the sanitary condition of the island now is.

The diseases causing the greatest number of deaths

were, for the Cidade Zone, those set forth in Table E³: congenital and senile debility.

TABLE E³.

Zone.	Sleeping sickness.	Congenital debility.	Senile debility.
Cidade	9	13	10

TABLE F.

Zones.	1911-12.		1912-13.	
	Percentage of general mortality.	Percentage sleeping sickness to general mortality.	Percentage to general mortality.	Percentage of sleeping sickness to general mortality.
Northern . .	15.4	67.3	8.8	55.4
North-East . .	9.2	47.2	5.5	38.7
East and West . .	14.1	48	5.8	46.1
Southern . .	5.2	32.7	3.1	17
Cidade . .	25	15	7	12

Comparing the percentages of general mortality of the various zones, we find that the Northern Zone stands first, then that of the Cidade, the East and West, the North-East, and, lastly, that of the Southern, for they are respectively 8.8, 7, 5.8, 5.5, and 3.1 per cent. The percentage of sleeping sickness to population is 4.6 per cent. in the Northern Zone, 2.6 per cent. in the East and West, 2.1 per cent. in the North-eastern, 1 per cent. in the Cidade, and 0.5 in the Southern Zone; and that of sleeping sickness to general mortality may be gathered from the respective Tables, in which it is to be seen that the zones maintain the former proportion, except the Southern, which shows

a higher figure than that of the Cidade. Comparing all the percentages of general mortality and those of sleeping sickness in relation to these, with those of the year 1911-12, we see that in all the zones there has been a great fall, easily observable in Table F. From the study of this Table it will be noticed that an extraordinary fall has taken place in the general mortality of the Zones Cidade, East and West, North, and North-East; which should encourage all the inhabitants to persevere in the work of sanitation.

The present percentages, no doubt, refer to deaths occurring during ten months, but calculating them in proportion for twelve months, they are still far below the figures for 1911 and 1912. What occurs with the various zones will be seen to be even more naturally the case when we include and present the percentage in relation to the total population of the island, *vide* Table G.

TABLE G.

Year.	Total population of island.	Total mortality.	Deaths from sleeping sickness.	Percentage of general mortality.	Percentage of sleeping sickness to population.	Percentage of deaths of sleeping sickness to general mortality.
1912-13	4938	286	105	5.7	2.4	36.4

We see from this Table that the percentage of general mortality, 5.7, is very small for an island where sleeping sickness used formerly to cause hundreds of deaths, and this can be recognised more clearly if we compare that percentage with that of preceding years, as shown in Table G¹.

TABLE G¹.

Years.	Total population.	Total deaths.	Deaths from sleeping sickness.	Percentage of general mortality.	Percentage of sleeping sickness to general mortality.
1909 . . .	3488	575	134	16·4	23·3
1910 . . .	3663	481	160	13·1	33·2
1911-12 . .	4309	531	239	12·3	42·1
1912-13 . .	4938	286	105	5·7	36·4

It will be seen from the foregoing that the general mortality of the island has dropped 50 per cent., compared with the year preceding (1911-1912), and we are sure it will fall still more, if only parents and guardians will but look after their children with the attention that these deserve, for the general mortality percentage of 5·7 per cent. ought then to become 3·8 per cent., to the good of humanity at large. From Schedule C., attached to this report, it is shown that the diseases causing most deaths in this island, after sleeping sickness, are, in descending order, congenital debility, anæmia of ankylostomiasis, diarrhœa, tetanus, and senile debility.

In Conclusion.—The island of Principe has 4,938 inhabitants, of whom 3,438 are *serviçaes*, 781 children of *serviçaes*, 430 adult natives, 120 children, and 169 Europeans. Of these 4,938, there died 286, 105 being old cases of sleeping sickness, and others deaths from various diseases enumerated in Schedule C. In the 286 deaths there were 92 of children, of diseases such as congenital debility, tetanus, anæmia of ankylostomiasis, diarrhœa, and intestinal parasites.

The percentage of general mortality and of sleeping sickness in relation to the population is, respectively, 5.7 per cent. and 2.4 per cent.

Brief observations upon the work of Prophylaxis carried out by the Planters against the spread of Sleeping Sickness in Principe.

We have spent ten months in the island up to now, and everyone knows the state in which we found the *roças* as regards execution of the law of 17th April 1911, as regards the malady itself. So that, to-day, we are in a position to state definitely that the work of prophylaxis carried out by all the planters has yielded the best of results, and this in the teeth of the expectation of many who thought it utopian to eliminate an evil which had for so long been a scourge to the inhabitants of the island of Principe.

We must confess that we ourselves did not look for results so surprising from the intelligent and well-considered execution of measures of prophylaxis as those which presented themselves in the last four months, when we undertook an inspection of the estates owned by Europeans; fresh cases of sleeping sickness diminished as if by magic, and the transmitting agent, the *glossina palpalis*, in its turn, no longer appeared on the roads and cultivated portions of the island except in very reduced numbers, and even then very seldom. Anyone who, like ourselves, knows this island from 1905, and in the years 1907 and 1908, when we formed part of the Corrêa Mendes Mission, and lastly in 1911, when confronted with the present state of affairs, would be inclined to doubt the possibility of so great an improvement in so short a time upon the sanitary conditions of Principe, for general mortality in some properties fell by 50 per cent. and in others by 70 and 80 per cent. All this is not attainable by mere talk, but is the result of the herculean task

undertaken by all the estate-owners. These are now fully convinced that the prophylactic measures ordered, when carried out in a scientific manner, give the best possible results as regards the sanitation of Principe.

We will briefly explain how it is that the planters have been able to improve so rapidly the sanitary condition of their properties. They began by draining all the swamps, felling the timber, etc., in the places where the *glossinas* took shelter, killing the pigs, clearing the secondary growth of scrub jungle, catching the flies by means of sticky stuff, and slaughtering the domestic animals attacked. They segregated the individuals infected until the trypanosomes had disappeared from the circulation, and finally they gave injections of atoxyl immediately on the sting of the fly. We are obliged to say, out of respect for truth, that some proprietors, on whose estates there were many swamps, had to sacrifice their plantations to effect the drainage required, and it was necessary that they should do this without loss of time so as to secure the valuable results now so manifest all over the island.

We have said elsewhere that by the combined efforts of the planting body as a whole and the Government, we have been able to make effective war upon the evil within a very short period, and to-day, after complete inspection, we are more convinced than ever that the extinction of the disease within the term of one year will be a fact when Government gives its approval to our project here reported and furnishes all the necessary elements asked for.

If at first some of the planters showed an unwillingness to comply with the law, now all, well or ill, are carrying out the measures prescribed, and some of them are even giving a rigorous compliance with the instructions issued by the Medical Mission. So great is the goodwill now evinced by all the planters that it has only been necessary to suggest that all animals attacked should be slaughtered, for this to be done, regardless of the sacrifice involved, purely in the interests of the labourers and thus of the agriculture and the country. Unfortunately we have to register the fact here that the proprietor of the

Roça Saudade, though an official of high rank who ought to be the first to carry out the law, through mere caprice elects to display his repugnance to the execution of prophylactic measures, thus setting a bad example to others.

Before beginning our description of what we have seen in each *roça* in the course of our inspection of the sanitation work so carefully carried out, we must not fail to give the place of honour to the Administrador of the *Roça Porto Real*, Senhor Manoel dos Santos Abreu, who has been one of the most resolute fighters in the war against the spread of sleeping sickness, and we do so because only thus can we do justice to the drainage and reclamation-work performed upon the numerous swamps extending through that property; a task carried out with the judgment and intelligence of one whose single idea has been to reform an estate which used to furnish an enormous contingent of deaths, and this regardless of the expense in money and in the re-plantation of cacao-trees. We can honestly declare that to-day the *Roça Porto Real* stands as a model of good sanitation among the estates as regards its scrupulous compliance with the law of 17th April 1911. This declaration we feel ourselves bound to make, though it may offend the modesty of the Administrador in question, for we should do him an injustice by withholding it. What he has achieved in so short a time is notable, not only as regards reduced mortality among the *serviçaes* but also in the matter of checking the recurrence of fresh cases of sleeping sickness, now reduced to insignificance.

Besides this Administrador, there are others worthy of special consideration as faithful and discreet executors of the law. We may cite Senhor Francisco José da Silveira and José Maria Perdigão, of the *Roça Infante D. Henrique*, who, although that estate has no *glossinas*, have not made that an excuse for non-fulfilment of the measures suggested; Senhor Miguel Redondo Jimenez, Administrador of the *Roça Sundy*, and Joaquim de Souza Barbosa, factor of the same estate, who have latterly, with excellent

judgment, carried out all prophylactic work advised, and are now reaping the good results of it; Senhor José Armindo Ramos, who has drained the swamps nearest to the beach, and has intelligently done all the law requires; but it is a pity that the labouring establishment should be so reduced, as much more might have been expected from the goodwill of the Administrador of the *Roça Abbade*; Senhor Joaquim Ferreira Barreto, Administrador of the Companhia Agrícola de Bella Vista, who has carried out with discretion all measures recommended for the benefit of his estate and labourers. We must, moreover, place on record the names of Messrs Antonio Montez Champalimaud, owner of the *Roça Nova Cintra*; Adelino de Moura, Administrador of the *Roça Ribeira Izé*; Marcellino Lapa, Administrador of *Nova Cuba*; Joaquim Carneiro and David Guedes de Carvalho, Administradores of the *Roça Sant'Anna*; Antonio Ruivo da Costa, Administrador of the properties of Lourenço José Monteiro; Antonio Pinho, factor of the *Roça Santo Christo*; all of whom have spared no pains in the execution of measures of sanitation, benefiting in this way humanity in general.

We would add the names of Messrs Antonio Luiz Olaio, present Administrador of the *Roça Terreiro Velho*; Manoel Francisco Machado, in charge of the *Roça Bom-Bom*; and Antonio Cæetano Taveira, of the *Roça Futuro*; who have judiciously carried out the law for checking the spread of sleeping sickness.

In the inspection we made of the various properties, we were accompanied, by invitation given so that they might convince themselves of the sanitary work done, and the benefit derived therefrom, by the following gentlemen: Messrs Manoel dos Santos Abreu, José Armindo Ramos, Marcellino Lapa, David Guedes de Carvalho, Antonio Champalimaud, Joaquim Barbosa, Antonio Pinho, José Ramos (agent Empresa de Navegação), Antonio Ramos and Manoel Lopes, merchants, who were unanimous in testifying their admiration for the success obtained in the warfare against the spread of sleeping sickness in the island. We would here express our gratitude, with a thousand

thanks for the trouble they have taken and the sacrifices they have made.

Resumé of Work done by Owners and Managers of Estates to check the Spread of Sleeping Sickness.

Inspection.

We began our inspection in the Northern Region on the 28th April and ended it on the 18th May in the East and West Region.

Rocha Sundy.—On the 28th April we inspected this property, going through not only the *dependencias* (subdivisions), but also the swamps: Ribeira Lama, Ribeira Tronco, and Praia Iola; on the 29th idem we visited the headquarters of the estate and examined the cases, old and new, of sleeping sickness among the labourers. The impression we gained, from our inspection of the sanitation work now done on the *Rocha Sundy* to check the spread of the disease, was that this estate no longer maintains its former attitude of indifference; we therefore hope that the work thus begun will not for a moment be left off, in the interests of the *serviçaes* and the inhabitants of the island.

We began our inspection at Ribeira Lama, that being a spot where there used always to be swarms of *glossinas*; but the absence of these, noted by all of us during the thirty minutes we stood there, was an agreeable surprise, for three months before the swamp was drained and its edges cleared, all who went there used to be persecuted by them, as my former inspection reports will testify.

We looked at other pieces of drainage work upon small swamps where formerly many *glossinas* used to be caught. The stagnant waters of these are now being drawn off into the Ribeira Lama by a series of works intelligently directed by the factor-general Senhor Joaquim de Souza

Barbosa; and at the end of a fairly long stay at the principal points where the fly used to abound, we did not see a single *glossina*, although the atmospheric conditions were favourable for their attacking us did they exist. We noted, however, that the swamp of Ribeira Lama requires to be deepened, but as this could not be done during the rains, we hope that the factor-general will do it as soon as the dry season begins.

Besides the drainage of the swamp in question, we noted similar services rendered in the swamps Ribeira Tronco and Praia Iola, with the happiest of results, for the *glossina* disappeared as if by magic immediately the work was completed. We visited all the *dependencias* and did not find a fly except in the *dependencia* S. Jeronymo, thus proving that the *Roça Sundy* has at last aroused itself from its habitual lethargy of a few years ago.

As the operations against the spread of disease have to be executed in an intensive form, whilst the estate is large and the establishments much reduced, the owners ought to get more *serviçaes* without loss of time, so as not to suffer material loss, for the fight against such a disease cannot be let stop without grave injury to the sanitation of both the property and the whole island. All the efforts put forth by the *Roça Sundy*, and all its sacrifices in compliance with the law of 17th April, will prove of no avail if other factors of hygiene do not come into operation for the wellbeing of the *serviçaes*. This unfortunately does not hold good in all the *dependencias*, for in the majority there are unhealthy quarters for the housing of the labourers. We shall here describe briefly the dwellings of the *dependencias* so as to show, later on, the modifications they should undergo to become hygienic and fit for human habitation.

Dependencias.

Iola . . . notes omitted—of purely local interest.

Ponta do Sol . . . notes omitted—of purely local interest.

Oqué Daniel . . . notes omitted—of purely local interest.

S. Jeronymo . . . notes omitted—of purely local interest.

Oqué José . . . notes omitted—of purely local interest.

Oqué Gaspar . . . notes omitted—of purely local interest.

From this summary description of the dwellings and native lines of the *dependencias*, it will be seen that all are unhygienic; but those of Oqué José, Oqué Gaspar, and S. Jeronymo can be made use of if the floors are cemented, windows opened, and certain small repairs made. This cannot be done with the others, which should be destroyed and new buildings constructed of masonry walls, cemented floors, and roofs of Marseilles tiles. If the lines at the *dependencias* are in the state we have indicated, those at the head-quarters of the estate also call for immediate repairs, such as re-pointing the walls in several places, lime-washing the majority, and properly cementing the floors so that the rats and mice do not finish them off by destroying what cement still remains from ancient days.

We also saw that the *serviçaes* made a practice of lighting fires and cooking close to their houses, which should not be allowed as it is bad for their health.

We must not omit to record here that a plantation so important and rich as *Sundy* ought to have a good and hygienic hospital, that now in existence being destroyed as its disinfection and even its cleansing have become difficult. If at the moment it has an air of cleanliness, it is due

to the efforts of the present hospital assistant, who has carried out fully and intelligently the orders of the medical officer of the zone, showing in his treatment of the patients that spirit of method and kindness which every attendant upon the sick should possess for the proper fulfilment of his mission.

Lastly, now that it has been explained to them, we hope that the owners of the *Roça Sundry* will not have a moment's hesitation in making further sacrifices for the improvement of the situation of their labourers, and will never abandon the question of sanitation, issuing always stringent and elucidative orders to their agents for the execution, whatever may be the expenses they may have to incur out of the material profits of the estate, of all necessary measures of hygiene, for only in this way will they find themselves recompensed later on for all their labours and outlay.

Résumé of Sanitary Work done within Ten Months.

Drainage of swamps Ribeira Lama, Ribeira Tronco, and Praia Iola. Partial fellings, carried out over four kilometres in the regions Tronco, Oqué Caça, Ponta do Sol, Oqué Daniel, S. Jeronymo, and Oqué Gaspar.

Number of flies caught, 51,581.

Number of pigs killed, 13.

Number of oxen slaughtered on being found infected, 5.

Number of persons treated by injection after stings of flies, 51.

Work of the Medical Officer of the Zone.

Population, 595. Persons examined, 516; found with trypanosomes, 37, with filaria, 18, with malaria parasites, 18. Fresh cases of sleeping sickness, 27, old cases, 107. Total 144.

The percentage of fresh cases to persons examined is 7.1 per cent., and that of total cases to population, 6.3 per

cent.; of sleeping sickness to general mortality, 61.2 per cent. The number of deaths of infants was 16.

Roça Ribeira Izé.—The labourers' lines are built with wooden walls, the floors are cemented, the roofs covered with Marseilles tiles, the windows small and protected. Accommodation ample, clean, and lime-washed, the yards were clean, and the swamp Ribeira Izé which marches with the *Roça Sundry* along the sea-shore was quite clean, but the greatest care will be required to keep it up to its present standard so as to prevent the fly from breeding there. The administrador of the *Roça*, Senhor Adelino Moura, not only means to carry out intelligently the work of prophylaxis against the spread of disease, but will take in hand the general hygiene, for only thus can the *serviçaes'* quarters be made healthy and good.

We have however to note that in order to keep the estate as clean as it is zealously desired to be, the owner must acquire more hands to man a sanitary gang on the lines prescribed by the decree of 17th April 1911.

Resumé of Work done in Ten Months.

Partial cleaning-up of the swamp Ribeira Izé. Number of flies caught, 1,350. Number of persons injected with atoxyl after having been stung by the fly, 16.

Work of the Medical Officer of the Zone.

Population, 70. Persons examined, 70, filaria found only in 3, and malaria parasites in 5. There is one old case of sleeping sickness. The percentage of old cases to population is 1.4 per cent. The mortality during the ten months was 4, 2 being infants, 1 from external violence, and 1 from tetanus. Percentage of general mortality, 5.7 per cent.

Roça Bom-Bom.—The labourers' quarters were described in the report of 20th November 1912. They are hygienic and clean. The stable, which was in a very bad state, is going to be replaced shortly by a new one on a good hygienic plan. The estate was quite clean, and the small swamps had been drained, but what struck us unfavourably was to find four fresh cases of sleeping sickness during our labours of ten months, which shows that the establishments have not been educated up to complaining when stung by the *glossina*, so that immediate injections of atoxyl may be administered to them.

In combating the spread of sleeping sickness, one has to maintain a rigorous watchfulness over the most trivial things, so that from all in combination the best possible result may be derived; for this reason we would urge a greater attention to the need for giving injections to the persons attacked by the fly.

Resumé of Work done during the Ten Months.

Drainage of small swamps. Cleaning-up of brooks. Number of flies caught, 549. Number of persons injected after being stung, 5.

Work of the Medical Officer of the Zone.

Population, 66. Persons examined, 65, 4 of whom showed trypanosomes, 3 filaria, 7 parasites of malaria. The percentage of fresh cases to persons examined was 6.1 per cent. Mortality in ten months, 2. Percentage of general mortality, 3.

Roça Santa Ritta . . . notes omitted—of merely local interest.

The whole *roça*, from the point of view of preventive measures, might be free from high undergrowth and weeds, and there might be greater cleanliness about the swamps

which have been drained by the present manager of the estate. We moreover think that the present establishments, properly trained, might do more work towards sanitation for the benefit both of the *serviçaes* and of the estate-owner himself. The houses of the workers are, after a fashion, protected against the carrier-fly, but the cattle sheds cannot be, and the only remedy for their case is to set fire to them.

Work done within the Ten Months.

Drainage of the swamps and partial cleansing of their margins. Number of flies caught, 837. Number of persons injected after having been stung by the *glossina*, 30.

Work of the Medical Officer of the Zone.

Population, 80. Persons examined, 80, of whom 1 showed trypanosomes, 2 filaria, 1 malaria parasites. Percentage of fresh cases of sleeping sickness to persons examined 1.2 per cent. General mortality, 3, of whom 2 were sleeping sickness cases. Percentage of general mortality 3.7 per cent. and of sleeping sickness, 2.2 per cent. Percentage of sleeping sickness to general mortality, 66.6 per cent. Deaths of children, 1.

Roça Aguiem.—The *sanzallas* (labourers' lines), to be made good and healthy, want lime-washing, their floors to be cemented, the bedsteads planked and the windows opened, for, kept shut as they are, to save replacing the damaged wire netting, is an unpardonable breach of the most rudimentary principles of hygiene. The cow-sheds are everything that is unhygienic, but they are protected against the carrier-fly. The estate itself is clean everywhere, although it has not a large establishment of workmen, and is evidence that the administrador is keen upon complying with the law.

Work done in the Ten Months.

Small swamp drained. Flies caught, 13. Number of persons injected after having been stung, 5.

Work of Medical Officer of Zone.

Population, 29. Persons examined, 29, of whom 1 showed parasites of malaria. General mortality, 1, this being an old case of sleeping sickness.

Percentage of general mortality, 3.4; sleeping sickness to population, 3.4, and of sleeping sickness to general mortality, 100.

Rocha Cascalheira.—The labourers' lines are anti-hygienic, as we have already reported in our report of November 1912, but they are now protected against the carrier-fly, and are clean and lime-washed. They will shortly be replaced, so the administrador of the Companhia Agricola de Bella Vista tells us, by others of a hygienic type, which is much to be desired, especially as this administrador is skilled in the construction of good houses.

After the work of sanitation done by the official brigade on the *Rocha Cascalheira*, its conservancy has been kept up rigorously by the present man in charge, Manoel Cirne, who has not spared himself in the fulfilment of the orders issued by his chief. This is an estate that used to have abundance of *glossinas*, and now they are rarely to be seen.

Work done in the Ten Months.

Drainage of a small swamp near the beach. Number of flies caught, 26. Number of persons treated by injection after being stung, 3.

Work of the Medical Officer of the Zone.

Population, 40. Persons examined, 36, of whom 1 showed trypanosomes, 1 filaria, and 3 parasites of malaria. Percentages of fresh cases of persons examined, 2.7. General mortality, 2. Percentage of general mortality to population, 5. Deaths of children, 1.

Rocha Praia Inhame.—In the labourers' lines at the headquarters of the estate, or in some of them at least, the roofs should be tiled, and, in the *dependencia* Montalvão, the floors should be raised and cemented. The *serviçaes* should be trained out of the habit of throwing filth about in the vicinity of the lines, a thing which gives a very bad impression to visitors to the estate.

The present administrador Sr. Antonio Ruivo da Costa has done quite right in transferring the sick from the hut hitherto used to a better house furnished so as to make existence therein pleasanter, but we are of opinion that this property should have a building worthy the name of infirmary, altogether independent of the other dwellings.

Sanitary work has been carried out by the present administrador on quite sound lines, and zeal has been shown in the improving of the sanitary conditions of the estate he intelligently manages.

On the *Rocha Praia Inhame* numerous fresh cases of sleeping sickness have appeared, which goes to show that before the arrival of the present manager, sanitary work was carried out only in order to deceive the sanitary authorities, to the ultimate injury of the property.

Work done in the Ten Months.

Drainage of two swamps in the *dependencia* Montalvão, and cleaning-up of the brooks. Number of flies caught

436. Number of persons treated by injection after having been stung by flies, 14.

Work of the Medical Officer of the Zone.

Population, 140. Persons examined, 140, of whom 10 showed trypanosomes, 19 filaria, and parasites of malaria, 19.

Percentage of fresh cases to persons examined 7.3 per cent. General mortality, 5, of whom 3 were sleeping sickness cases. Percentage of general mortality, 3.5 per cent., of sleeping sickness to population, 2.1 per cent., and of sleeping sickness to general mortality, 60.

Rocha Sant'Anna.—The labourers' lines, although they appear cool because thatched with *andala* (dry fronds of palm), should be replaced by others with cemented floors, masonry walls, and tiled roofs. The present lines are not hygienic and the *serviçaes* cannot possibly be comfortable in them, for by their personal habits they only aggravate the anti-hygienic conditions of such a style of dwelling. The estate generally is clean, and the present administrador, Sr. David Guedes de Carvalho, has taken great trouble to clean up the right bank of the big swamp known as Praia Grande.

In this property it is a long time since any *glossinas* at all have been seen, and we have not found any trypanosomes in the blood of the persons we have examined.

Work done in the Ten Months.

Cleaning up the bank of the Praia Grande swamp which belongs to this estate. Number of flies caught, 10. Brooks cleaned.

Work of the Medical Officer of the Zone.

Population, 89. Persons examined, 84, of whom 5 showed filaria, 18, malaria parasites. Old cases of sleeping sickness, 6.

Percentage of persons attacked (sleeping sickness) to population 5.7 per cent. General mortality, 5, all being cases of sleeping sickness. Percentage of mortality and of sleeping sickness to population is 5.6 per cent., and percentage of sleeping sickness to general mortality, 100 per cent.

Rocha Bellomonte.—The new labourers' lines built in the *dependencia* Preguiça are good and hygienic, but the zinc roofs should be replaced with tile roofs as the general manager hopes shortly to do. All the old erections on the estate, condemned as anti-hygienic, are being destroyed and replaced, as should be done by anyone who has the wellbeing of the *serviçaes* at heart.

The cleaning up of the banks of the brooks and the draining of the small swamps has been carried out with regularity, but it seems unfortunate that the man in charge, Sr. Antonio Napoles de Carvalho, should not have been made aware of the position of the boundaries of the property, for we are sure that had he known them, he would not have failed to clean up the bed of the stream facing the Paciencia estate, beside Praia Grande, where we found two flies. We mention this because we recognise in him every intention of obeying the rules. When the matter was brought to his notice he at once directed workmen to start cleaning the brook in question.

Work done in the Ten Months.

Draining of small swamps; cleansing of brooks. Number of flies caught, 11; number of persons treated with injections, 3.

Work of the Medical Officer of the Zone.

Population, 113. Number of persons examined, 100, of whom 1 showed trypanosomes, and 3 parasites of malaria.

Percentage of fresh cases to persons examined, 1; general mortality, 13; percentage of general mortality, 11.5 per cent. Number of deaths of children, 10.

Roça Paciencia.—Some of the *sanzallas* (negro labourers' lines) might be made good with the alterations indicated, but others, among them those destined for the reception of infected persons for isolation purposes, are unhygienic, not merely through inadequacy of cubic air-space for the inmates, but also from the filth accumulated around them, thrown out by the *serviçaes*, and the droppings of the pigeons who share the quarters with the human inhabitants.

The best house on the place is the cow-shed, which is being extended so as to improve the condition of the animals, which are very expensive here. At our inspection we saw that the owner's best attention was taken up with his cacao and his cattle, for the Praia Grande swamp was not clean, nor the smaller swamps properly drained, nor yet the scrub jungle eradicated; and, lastly, the sick were very badly housed. The European assistants' quarters are not so good as the cattle shed, and, to make matters worse, hides are stored in them under the same roof. We must mention, however, that as soon as the owner has set up his Decauville light railway he is going to start the building of new houses, if his cacao harvesting will allow him time to do so.

Work done in the Ten Months.

Removal of rank vegetation, but only round about the cacao-trees. Flies caught, 19. Persons treated by injection, 1.

Work of the Medical Officer of the Zone.

Population, 159. Persons examined, 140, of whom 3 showed trypanosomes, 1 filaria, and 1 parasites of malaria. Percentage of fresh cases to persons examined, 2.1 per cent. Total persons attacked now on the estate, 20. Percentage of total cases to population, 12.6 per cent. General mortality, 5, of whom 4 are sleeping sickness cases. Percentage of general mortality, 3.1 per cent.; of sleeping sickness to population, 2.5 per cent., and of sleeping sickness to general mortality, 80 per cent.

Roça Saudade.—The *sanzallas*, or some of them, can be made useful if Marseilles tiling be substituted for the present zinc roofing, the floors at the same time being cemented, and some windows opened; others, with zinc walls and roofs, should be pulled down. These lines, besides being unhygienic, are full of filth and dirt, both inside and out, so much so as to horrify those who have to inspect them. The dogs were running about at liberty, and this was not the first time we found them out of their proper kennels; but the owner, who always tried to talk us round and move us to pity him, got no attention from us on this occasion, and was properly fined for it. As for the sanitary work, it is done after a fashion, but the property is a small one.

Work done in the Ten Months.

Weeding in the planted lands. Number of flies caught, 17.

Work of the Medical Officer of the Zone.

Population, 31. Persons examined, 26, of whom 1 showed trypanosomes, and 6 parasites of malaria. Percentage of fresh cases to persons examined, 3.8 per cent.

Total sufferers from the disease on the estate, 2. Percentage of total cases to population, 6.4 per cent. General mortality, 1. Percentage of general mortality, 3.2 per cent.

Roça Futuro.—The native lines, already described in my report of November 1912, are very good and hygienic, as are all the other houses on the estate, except the cowshed, which should be destroyed so as not to detract from the standard maintained throughout the rest of the property.

In spite of his efforts and goodwill, the administrador, Senhor Antonio Taveira, will not be able to keep the brooks constantly clean for want of hands to do the work, which is a serious drawback to sanitation. We hope he will rigorously enforce the treatment by injection immediately upon cases of sting by the *glossina*, for the two fresh cases of sleeping sickness on so small an estate furnish a clear indication that the utmost care is necessary.

Work done during the Ten Months.

Partial cleansing of the banks of streams.

Work of the Medical Officer of the Zone.

Population, 27. Persons examined, 27, of whom 2 showed trypanosomes, 1 filaria, and 1 parasites of malaria. Percentage of fresh cases to persons examined, 7.4 per cent. General mortality, 2, all being children. Percentage of general mortality to population, 7.4 per cent.

Roça S. João.—The *sanzallas* with zinc roofs, walls of rotten wood, and uncemented floors, should be destroyed. Other houses with tiled roofs and cement floors will be quite healthy if their zinc walls be replaced by stonework, and some windows opened in them.

The brooks of the estate should be always kept clean,

to prevent the water from stagnating in them and thus forming a breeding-ground for the larva of the fly.

The present cattle-shed is very badly situated and badly conditioned for purposes of cleanliness.

The owner is going to undertake the improvements indicated, and will complete them within a year's time.

Work done during the Ten Months.

Partial cleaning of the brooks.

Work of the Medical Officer of the Zone.

Population, 66. Persons examined, 59, of whom 1 showed trypanosomes, 4 filaria, and 4 parasites of malaria. The case of sleeping sickness noted was a *serviçal* of Uba-Budo. Percentage of fresh cases to persons examined, 1.6 per cent. General mortality, 1. Percentage of general mortality, 1.5 per cent.

Rocha Abbade.—The negro lines are very good and hygienic, a cleanliness and order reigning which can only be maintained by one who understands thoroughly how to manage an estate such as this. The work of draining the Praia swamp, now almost completed, has been well designed, a thing by no means too common on this island. The Praia Salgada swamp is clean, but it wants to be filled up, and this we hope the administrador will see to during the dry weather.

The brooks of the estate were all clean at our visit, and in some parts well-deepened, so as to prevent any stagnation of their waters. The whole estate was clean and carefully attended to, despite the scanty establishment it possesses. We hope that the Sociedade Abbade will get more men, so that the manager may be in a position to intensify the work of a property covering four kilometres, and thus do the cause of sanitation a great service.

We would also suggest that the Society give the required sanction to the building of a hospital with masonry walls, if only to bring it into harmony with the rest of the houses on the property.

The administrador, with that spirit of humanity which characterises him, has succeeded in considerably improving the sanitary state of the *roça*, for which he deserves full credit.

Work done in the Ten Months.

Draining of the Praia swamp, that of Praia Salgada, and of other small swamps scattered about the *roça*. Number of flies caught, 13; number of persons treated to injections after having been stung, 3; number of pigs killed, 1.

Work of the Medical Officer of the Zone.

Population, 151. Persons examined, 151, of whom 2 showed trypanosomes, 11 filaria, and 15 parasites of malaria. Percentage of fresh cases to persons examined, 1.3 per cent. General mortality, 4, 3 being children. Percentage of general mortality, 2.6 per cent.

Roça Bella Vista.—The labourers' lines, with the slight modifications indicated, are good and hygienic. Cleanliness and order prevail, we note, both on the estate lands and inside the houses of the *serviçaes*, which shows how efficiently the administrador-general of the Companhia da Bella Vista has fought for hygiene.

We have taken note also of the drainage-work of the swamps, and, when we pointed out that some of the channels required deepening to about half a metre to allow of the free flow of water, the manager, Sr. Joaquim Ferreira Barreto, at once directed this to be done.

The cleaning-up of the brooks on the estate has in





Banzu swamp (Praia Caixa), on the *Rocha* Porto Real. Glossinas used to be very numerous here, and men at work got badly stung by them. Now, thanks to drainage and reclamation work, it is difficult to find a single fly about the place.

general been carefully done, showing, along with the work as a whole, how fully convinced the administrador is of the excellent results to be derived from a scrupulous execution of the prophylactic measures for the sanitation of the estates under his superintendence.

As the *Roca Bella Vista* has no hospital, the administrador proposes to erect one on approved hygienic lines.

There are two mules suffering from trypanosomiasis which, now that the inefficiency of atoxyl as a prophylactic in the case of animals has been demonstrated, must be slaughtered. Meanwhile, they are only being used for urgent night duty upon the estate.

Work done in the Ten Months.

Draining of various swamps and cleansing of brooks. Number of flies caught, 879; number of mules attacked and killed, 2; number of persons injected after having been stung by the fly, 8.

Work of the Medical Officer of the Zone.

Population, 154. Persons examined, 140, of whom 4 showed trypanosomes, 5 filaria, and malaria, 15. Percentage of fresh cases to persons examined, 2.8 per cent. General mortality, 8, 1 being a case of sleeping sickness, and 4 children. Percentage of general mortality, 5.1 per cent.; of sleeping sickness to population, 0.6; and of sleeping sickness to general mortality, 12.5 per cent.

Roca Santo Christo.—The labourers' lines (*sanzallas*), with the modifications suggested on inspection, are quite in order; but the house intended for the segregation of sick persons is badly situated, and not in a hygienic state. Senhor Antonio Pinho, factor of the estate, has carried out all the prescriptions of the law of 17th April 1911,

and we hope, therefore, that injections of atoxyl will be given immediately any one is stung by the fly.

We cannot fail to congratulate Sr. Pinho on having decided to protect his own dwelling-house from the fly, in spite of the reluctance he first showed to this measure. This estate has no swamps worthy of mention.

Work done in the Ten Months.

Cleaning-up of the estate in general. Number of flies caught, 9.

Work of the Medical Officer of the Zone.

Population, 99. Persons examined, 99, of whom 1 showed trypanosomes, 17 filaria, and 9 malaria parasites. Percentage of fresh cases in relation to persons examined, 1. Total existing cases, 3. Percentage of total cases to population, 3. General mortality, 9, 4 being sleeping sickness cases, and 2 children. Percentage of general mortality, 9; of sleeping sickness to population, 4; and of sleeping sickness to general mortality, 44.4 per cent.

Rocha Nova Estrella.—Some of the *sanzallas* might be passed as sound, with the modifications pointed out during the inspection; but others, with walls and floors of rotten wood, and zinc roofs, should be destroyed as unhealthy.

The draining of the swamp, the general cleansing of the estate, and the other measures put into execution intelligently and on a good plan, show that the tenant of *Nova Estrella* and the owner of *Nova Cintra*, Senhor A. Champalimaud, has done all in his power to sanitize the *roças* in his charge; he is one of the proprietors who ordered a mule to be slaughtered as soon as he was satisfied that atoxyl, even in large doses, would not drive the trypanosome out of its circulation.

The Nova Estrella estate has had no fresh cases of sleeping sickness, and the five cases existing are from the time of the Corrêa Mendes Mission, which shows that the owner has complied with the law in the right spirit.

Work Done in Ten Months.

Draining a swamp. Number of flies caught, 95, number of persons treated with injections, 5.

Work of the Medical Officer of the Zone.

Population, 116. Persons examined 113, of whom 15 showed filaria, and 17 malaria. Old and fresh cases of sleeping sickness, 5. Percentage of persons attacked to population, 4.3 per cent.

Roça Terreiro Velho.—The *sanzallas*, both at headquarters and at the *dependencia* Ribeira Fria, are anti-hygienic; but those at headquarters, with extensive repairs and transfer to another site in the yard, might be made regular. We noted on inspection that both the yard and the *sanzallas* were full of sweepings and filth which were at once removed. Cleanliness has now been maintained with some strictness, so that the *serviçaes'* yard should not become more unhealthy than it is by its own nature and position.

We saw with a certain pleasure that Sr. Antonio Olaio, the present acting manager, had drained a swamp close to the yard, but as the draining-work was insufficient, he was advised by us to deepen it by half a mètre which he at once did.

It is incumbent on the estate-owner that he should not give his whole attention to cacao, as he has up to now to a great extent done, and that he should do as other proprietors have done, sacrificing his plantations where necessary so as to obtain the best results in the direction

of sanitation. There is a swamp close to the beach which calls for improvement and we hope that the present administrator will set to work upon it without loss of time. The estate of Terreiro Velho does not possess a hospital worthy the name; so it behoves the proprietors to issue orders not only for its immediate construction on the plan submitted by one of the managers, but also for the reconstruction of the native lines of the estate headquarters and the *dependencia* Ribeira Fria.

The present manager has shown us great good-will in what is for the benefit of the workmen employed under his orders; but, unfortunately, their number is small for all the work to be done, both agricultural and sanitary.

Work Done in the Ten Months.

Draining the swamp. Fellings in the region *Oqué Pipi*; cleansing of the beds of streams. Number of flies caught, 1,663. Number of persons injected after having been stung by the fly, 21.

Work of the Medical Officer of the Zone.

Population, 267. Persons examined, 242, of whom 10 showed trypanosomes, 41 filaria, and 26 malaria parasites. Percentage of fresh cases to persons examined, 3.7 per cent. General mortality 10, 1 being a child, and 2 adults from sleeping sickness. Percentage of general mortality, 3.7 per cent.; of sleeping sickness to population 0.7 per cent., and of sleeping sickness to general mortality, 20 per cent.

Rocha Infante D. Henrique.—We visited the headquarters and the *dependencias* Neves Ferreira, Praia, and Ribeira Fria, and we noted not only the entire fulfilment of the law of 17th April 1911, but also a great care in matters of general hygiene, as evidenced in the fine

housing both of the *serviçaes* and the European employés, looked at from all points of view, and in the result, that all enjoyed the best of health, the number of sick being insignificant.

Both Senhor J. M. Silveira and his assistant, José M. Perdigão, have taken the utmost trouble to keep the estate free from the carrier fly, all our suggestions being promptly carried out, the borders of the estate marching with adjoining properties where the *glossina* is to be found being kept clean, with a view to co-operation in the general sanitation of the zone; an important matter to record.

Work Done in the Ten Months.

Felling and clearing the forest-land of Oqué Pipi; the cleaning of the beds of streams, and of the estate in general.

Work of the Medical Officer on the Zone.

Population, 616. Persons examined, 78; of whom 10 showed filaria, and 4 parasites of malaria. General mortality, 15, one being a sleeping sickness patient, and 10 being children. Percentage of general mortality, 2.4. Percentage of sleeping sickness to population, 0.1 per cent., and of sleeping sickness to general mortality, 6.6 per cent.

Roça Porto Real (East and West).—In this property the measures of prophylaxis against the spread of sleeping sickness have been executed with remarkable judgment. During the two days we spent in inspecting this estate, we were struck by the enormous sacrifice, and the efforts made by the manager, Sr. Manoel dos Santos Abreu, in order to carry out the work of sanitation and fight the evil which in former days used to decimate the hands of the estate.

We were agreeably surprised to find that the administrator did not for a moment hesitate in presence of a

thousand difficulties to carry out the draining of swamps such as the Bacharel, Banzú (Praia Caixão), and others, enough to discourage most people from the formidable embankments and fillings required, the deep cuttings on rocky soil, and lastly the innumerable drainage channels to be cut to let out the water completely from swamps which in former days used to be so many nurseries for the breeding of the fly which carries the disease. At our inspection we examined not merely the drainage work of the swamps in question, but of others likewise of great extent, such as the Ribeira Gallinha, in the *dependencia* Pincaté, the Lapa, the Fundão, the Corrêa, etc., all drained by means of a series of works which only Senhor Abreu, with his energy, zeal, and perspicacity, could bring to a successful conclusion, and thus sanitize an extensive property so full of swamps as Porto-Real is. Besides the execution of the measures of prophylaxis, we noted the respect shown by all the assistants of the estate for the principles of general hygiene. We are not exaggerating when we say that the Roça Porto-Real may to-day serve as a model in the island to all its planters in matters of sanitation.

The impression given by our inspection of the various sections of this property was that the administrador had a special gift for educating his assistants to co-operate in fighting the disease of sleeping sickness, and indeed it is only thus that one can hope to eliminate so fell a malady; for it is upon persistent work and the observance of the smallest details of prophylaxis that depend the resultant benefits that this property is now enjoying.

We must not overlook the names of two subaltern employés of the Roça Porto-Real, one an assistant in the hospital of the headquarters, Senhor José Antonio Perdigão, the other, in charge of the Pincaté section, Senhor José Simões Abreu; for the first, doing his duty as a good hospital assistant, treating the patients carefully according to the prescription of the doctor of the Zone, has helped him most zealously and intelligently; the second-named has been the right-hand man of the administrador in the work of draining the swamps of the section, a work beyond all praise.

After describing briefly our impressions of the special and general sanitation of the estate, we must not fail here to point out what are the kind of quarters provided for *serviçaes* at the headquarters and dependencias, and what are the alterations required to make them more hygienic.

Headquarters.—Some of the *sanzallas* (negro workers' lines) have masonry walls, cement floors, roofs of Marseilles tiles, and are clean and well lighted by windows. These are good and hygienic. Others only have their outer walls of masonry, but the interior partitions are of wood, the floors paved, the roofs tiled with Marseilles tiles, lighted from windows, and are clean and lime-washed. These could be made good and hygienic were the floors cemented and masonry walls substituted for the wooden partitions.

Pincaté Section.—Some of the native lines have masonry walls, cement floors, roofs of Marseilles tiles, and are ample, lighted by windows, clean, and lime-washed; others have wooden or zinc walls, roofs tiled and floors paved, with windows and wide verandahs. The wooden and zinc partitions might be replaced with masonry walls, and the floors cemented, to make them sanitary.

S. Matheus . . . notes omitted—of merely local interest.

S. Joaquim . . . notes omitted—of merely local interest.

Lapa (Anselmo d'Andrade) . . . notes omitted—of merely local interest.

Correa (Mantero and Mendonça) . . . notes omitted—of merely local interest.

Fundão . . . notes omitted—of merely local interest.

Santa Trindade (Pico) . . . notes omitted—of merely local interest.

From the detailed description of the dwellings destined for the working establishments, it will be seen that Sr. Manoel d'Abreu is guided throughout by principles of humanity, this being the explanation of the fact that the houses now ordered to be constructed are to be good and hygienic, just as are those of the sections Lapa, Fundão, Pico, and Corrêa; thus we must regard the administrador of the property as a benefactor to the island, not merely for having worked earnestly and uninterruptedly in the fight against sleeping sickness, but also for his keen championship of the well-being of the *serviçal*.

It would take us much time here to describe all the works carried out on the Porto-Real estate, but we must not omit to mention that the fellings effected with the aid of the official brigade, there being insufficient men on the property itself, over an area of approximately five square kilometres infested by the *glossina*, have been so fruitful of results that at once the number of flies fell as if by magic, for from ten to twelve thousand flies per mensem, only a thousand or five hundred were to be found, and this in places where the full effect of the sanitary measures could not be had for want of men to do the work.

During the two days of our inspection, we went through all the drained swamps, but neither found nor saw a single *glossina*, although formerly, before the work of sanitation was done, hundreds were to be found; thus the administrador Sr. Manoel d'Abreu may congratulate himself on having succeeded in sanitating a property which at one time used to give an enormous contingent to the death-rate of the island of Principe.

The works judiciously undertaken on the *Rocha Porto-Real*, and the resultant benefits obtained, should encourage the other proprietors of the island to imitate them, so as to get similar results redounding to the welfare of Principe.

We would note that absolutely nothing has been wanting, be it in the treatment or the housing of the *serviçaes*, on Porto-Real, but the pity is that up to now no house has been built suitable for a crèche, for with children in so





A bit of the Lapa swamp, on the *Roca* Porto Real, formerly so infested by swarms of flies that nobody dared cross it. Its transformation by means of drainage and reclamation has been so complete that it may be traversed in every direction without a single glossina being found. This was the spot chosen expressly for the picnic breakfast given in honour of the chief of the Sleeping Sickness Mission.

large numbers it is necessary to afford them every comfort and advantage of hygiene. It is to be hoped that the administrator will see to this matter, and thereby reduce the mortality of the infants on the island, which at times reaches a high figure. This improvement by the administrator of Porto-Real will be one more indication to his colleagues of the gain to be derived from such an outlay in the direction of preservation of child-life.

Work done in the Ten Months.

Draining of the swamps Bacharel, Banzú, Ribeira Callinha, Lapa, Fundão, Corrêa, etc. Cleaning the beds of streams in the estates. Complete felling of five kilometres of forest. Number of flies caught, 49,107. Number of persons treated by injection after having been stung by *glossinas*, 188. Number of pigs killed, 36; number of animals (domestic) slaughtered after being found infected, 19; namely, 3 mules, 2 oxen, 13 goats, and 1 dog.

Work of the Medical Officer of the Zone.

Population, 1,078. Persons examined, 875; of whom 31 showed trypanosomes, 150 filaria, 59 malaria parasites. Total percentage of fresh cases to persons examined, 3.5. Old cases of sleeping sickness on the estate, 88. Total persons attacked, 119. Total percentage of persons attacked to population, 11. General mortality, 67, of whom 33 were sleeping sickness cases, and 19 infants. General mortality percentage, 6.2; percentage of sleeping sickness to population, 3, and to general mortality, 49.2.

Roça Nova Cuba.—The *sanzallas* are roofed with zinc, have wooden walls, and badly paved floors. They are not large enough, but were clean and lime-washed. With liberal alterations which we have pointed out to the manager, they can be made quite good. The house set

apart for the outdoor assistant (European) is in the same state as the *sanzallas*, except that the floor is planked. The residence of the manager is very good and healthy.

Senhor Marcellino Lapa, the administrador of the *roça*, has carried out in the spirit and the letter the prophylactic measures laid down, and the proof of this lies in the way in which he has accomplished the draining of the swamp and the cleaning of the stream-beds, notwithstanding the very scanty establishment the property possesses. We trust that the owner of the estate will arrange for more hands without loss of time, so that the work of prophylaxis be not interrupted by the cacao harvest. All the efforts which the administrador Lapa is so meritoriously making will prove unfruitful if he cannot get more *serviçaes* than he at present has.

Work done in the Ten Months.

Drainage of small swamps. Cleaning of brooks. Number of flies caught, 43; number of persons injected after being stung by flies, 17.

Work of the Medical Officer of the Zone.

Population, 39. Persons examined, 30, of whom 1 showed filaria, and 7 malaria parasites. General mortality, *nil*.

Roça Mont'Alegre.—Possesses ample *sanzallas*, with wooden walls, tiled roofs, floors neither paved nor cemented. Fresh and clean. With the modifications we have pointed out to the manager, the houses of the *serviçaes* will be very good indeed.

The measures of prophylaxis laid down have been carried out by the administrador, Sr. Brito. The fresh cases of sleeping sickness on this estate are too many in proportion;

it would be well therefore, to inculcate the utmost care in the protection of the *serviçaes*, by showing them the danger they incur by not complaining when stung by the fly, so that they may at once receive injections of atoxyl.

The estate has at this moment 16 *serviçaes* attacked, of whom 5 may be noted as apparently cured.

Work done during the Ten Months.

Destruction of forests over a small area still uncleared on the estate. Cleaning of the stream-beds. Number of flies caught, 349; number of persons treated by injection after having been stung, 2.

Work of the Medical Officer of the Zone.

Population, 66. Persons examined, 59, of whom 4 showed trypanosomes, 4 filaria, and 1 malaria. Percentage of fresh cases to persons examined, 8.1. Total persons attacked, 16. Total percentage of persons attacked to population, 32.8, *vide* Schedule A. General mortality, 3 deaths, 2 being sleeping sickness cases, and 1 a child. Percentage of general mortality, 4.5; of sleeping sickness to population, 3; to general mortality, 66.6.

Conclusions.

1. Prophylactic measures against the spread of sleeping sickness are being carried out by all the planters, some more judiciously than others.

2. The planters have not only complied with the law of 17th April 1911, but also with all the instructions issued by the Medical Mission, having for their object the radical extinction of sleeping sickness.

3. The sacrifices made and the efforts made by all the owners and the Government have given fruitful results.

4. It being essential that the warfare against sleeping sickness be an intensive one, Government should facilitate the entry of labourers to the plantations, and get more men to make up the strength of the official brigade as decreed 17th August 1912.

5. Finally, the Government should give another organisation to the Mission, that is to say, that outlined by us in our proposition statement of 16th February 1913, and grant all the requirements therein asked for, to effect the total extinction of sleeping sickness within a short period.

Official Brigade and its Services in the Campaign against the Spread of Sleeping Sickness in the Island of Principe.

The official brigade was created in February 1911 by the then Governor of S. Thomé, Senhor Miranda Guedes, which means that its existence coincides with the labours undertaken against the spread of sleeping sickness.

That Governor was of opinion that it should play an important part in the fight against the transmitting agent (*glossina palpalis*), and, as he was unable at once to obtain the men required to bring it up to strength, he directed that the forty prisoners of war then in S. Thomé, scattered among private employers and public departments, should be told off to the brigade. With so small a number it was impossible to operate profitably in the waste lands and on those in native hands; however, for some time it achieved, in fellings of forests and cleaning-up of scrub-jungle, what could not be done on planted estates with twice as many men. All this was due to the headman of the official brigade, Sr. Joaquim Russo d'Oliveira, a tireless worker, intelligent, and endowed with a rare degree of energy.

The number of the establishment of the brigade was

sensibly increased by means of convicted *serviçaes* and more prisoners of war, and for two months it consisted of 150 strong men, fit for sanitation work, of these 150, 40 are Indians, who arrived in this island in a deplorable physical condition.

In the 17th August 1912 it was ordered that the Official Brigade was to consist of 300 men, but up to now the island of Prineipe has not had the satisfaction of seeing them, and, as the existing strength is insufficient for fighting intensively and effectually the *glossina*—the carrier of the disease—in the lands of the natives, which for the most part are abandoned, without care for the plantations of cacao thereon. The neglect with which the natives, almost without exception, treat their plantations, shows well their natural indolence, which became more accentuated when they learned that they would not have to pay anything for the services rendered them by the Brigade, in the case of their having no labourers of their own on their properties. We find it extraordinary that though there is a Native League here, that body should not have impressed its less intelligent members with the necessity for stamping out the sleeping sickness and thus escaping the annihilation of their race. But we only find on the part of the natives of the island a sickly fatalism.

The Official Brigade has worked on its lands, but the natives, instead of maintaining cleanliness, let their properties go to ruin, except for little patches which they used for the growing of manioc and millet.

When we made the inspection of the properties of the Europeans, we had to cross some of the lands held by natives, and we noted that they could not remain in the isolation they had adopted without grave risk to their European neighbours. Every native hut sheltered a dozen dogs, running wild, as if for the feeding of the *glossina*, and the natives attacked with sleeping sickness could with difficulty be got to submit to segregation and treatment, it being necessary to order them administratively to present themselves at the military hospital. The

more illiterate of them even now do not believe their fellow-countrymen to be suffering from sleeping sickness, for when they display symptoms of somnolence and mental aberration, they explain it as due to *fetish*. Be these things as they may, every citizen has to make himself useful to his country, and it is not by sleeping and spending one's time in merrymakings that a people can be regenerated.

The Native League should therefore start a vigorous propaganda among its fellow-countrymen of the less educated sort for the fulfilment of the law as far as possible, and the Government compel them to pay for the services of the Brigade in proportion to their means, whether they have or have not *serviçaes* contracted from outside the province, for what happens under the existing system serves merely to incite them to that form of idleness proverbial among those not compelled by want to do anything.

The Official Brigade has not only worked upon the lands of natives, but also upon those of Europeans, with the object of attacking important *foci* of the transmitting agent of disease for the general good of the island; Europeans however pay the expenses of the Brigade, although some of them are not in any better financial position than many natives.

The Brigade is at present divided into two sections, each one with its own European headman; one operates in the Southern, the other in the Northern region. The Southern section is composed of 50 men, sufficient for the effectual working of prophylaxis in that zone: but the Northern section, with a strength of 100 men, cannot work intensively and profitably on that of the Northern, North-Eastern, East and Western, and *Cidade* Zones. It is a matter for the urgent consideration of Government that 150 more men of physical capacity should be engaged to complete the fixed establishment, and thus obtain effective results for the sacrifices submitted to by all.

How the Brigade wages war against the *Glossina Palpalis*.

In our capacity of technical director of the Official Brigade, we have taken note of the various forest fellings, eradication of secondary scrub jungle, cleaning of stream-beds, drainage of swamps, slaughtering of pigs and other mammals running wild, and similar work which undertaken with judgment tend to the speedy extinction of the *glossina*. It is well known to all that the fly takes refuge in shady places, damp and frequented by animals, chiefly pig, insensible to the sting of the insect, which allow it to settle on them in large numbers and carry it about from place to place. These animals besides being vehicles for the fly, afford it a liberal sustenance, the insect being a blood-sucker.

We have seen as many as thirty *glossinas*, gorged with blood, hanging on the dead body of a pig; and the headman of the brigade tells us that whenever a pig is shot by his men, some *glossinas* are to be found attached to the carcass. We have always noticed that in places forming foci for the fly, whenever the lands are cleared up and the trees felled to open them out, killing any pigs found there, and draining any swamps that may exist, the *glossina* disappears in a wonderfully short space of time and never reappears, so long as cleanliness is maintained. This suggests to us that the development of the larva, nymph or pupa, does not take place under exposure to the direct light and heat of the sun. That is why we insist upon keeping the borders of the marshes and brooks free from all vegetation, and upon felling all the trees overhanging and shading these.

The scrub jungle ought always to be destroyed, especially when the land is inclined to be marshy and pig to shelter therein, for it is there that the fly finds conditions most favourable for its reproduction.

At the time when the Brigade was engaged upon the work above described, it took with it a number of *serviçaes*, dressed in black clothes smeared with birdlime so as to catch the flies.

To protect the *serviçaes*, that is to say, to prevent their being attacked by the disease, they should be given injections of atoxyl as soon as they are stung by the fly; but, unfortunately, we cannot in every case make sure of this being done, for the men, in many cases, may be far away from their encampment and only get back to receive the injection seven and eight hours later. We must attribute to the lack of strictness in this respect the appearance of trypanosomes in the case of four *serviçaes* of the Brigade, out of 120 whose blood was analysed; but nevertheless we consider we have been fortunate, seeing that these men have to work in the places most infested by the transmitting agent of the disease, the *glossina palpalis*.

From Schedule D. we see the area cleaned up and the forests felled by the men of the Brigade during the period of ten months (August 1912 to May 1913), and the slaughter of the animals running wild.

The number of flies caught by the Brigade was 110,691; that of pigs killed, 235, *lagaias*, 251, and stray dogs 272. To this number of dogs must be added 300 killed in the town area.

The area of lands cleaned-up by the Brigade, including fellings, eradication of secondary scrub, cleansing of swamps and streams, was approximately 65 square kilometres, a very big task for the small force engaged. This is due to the rare energy of the headman Joaquim Russo d'Oliveira, who unfortunately lost his left arm by an accident in the performance of his duty when hunting down a herd of wild pig, thus incapacitating him from earning his livelihood and that of his large family.

We consider that an officer, who, with so great zeal, and at the risk of his own life has rendered such eminent services in the campaign against the disease

should not be forgotten by Government. It is the least that can be done to grant him a pension and thus mitigate the distress of his children.

As Schedule D. shows fully all the works completed and the names of the estates in which the Official Brigade lent its services, we do not repeat them here so as not to make our narrative too tedious.

Sanitation of the Town of Sant'Antonio of Principe.

We will briefly explain what we have done to sanitize the town of Santo Antonio, the difficulties we have met with, and lastly the negligence of the inhabitants, due to the absence of a Code of contraventions and a Police force to compel the observance of sanitary measures.

In August 1912 we took charge of the Delegation of Health, and in the fulfilment of our duty, having seen that the town demanded a radical transformation, we set about making a series of close inspections of public establishments, gardens, streets, business houses, etc., in order to promote public health; unfortunately, however, we have only succeeded up to now in effecting improvements in matters concerning food stuffs, and those only after the infliction of fines rather than through the good advice and hygienic instructions issued by the Health Department of the Island.

It is matter of common knowledge that on our first inspections much adulterated food stuff was destroyed, some of it in an advanced state of putrefaction, yet being sold to the public without the least regard for health. If to-day the public can rest assured that what they buy is not adulterated except by some oversight on the part of a trader, they cannot yet have the same confidence as regards the cleanliness of their gardens and fronts of their houses, for most of these present close to their walls a mass of filth and sweepings of all kinds, in defiance of the most elementary rules of hygiene.

Respect for truth compels us to admit that one or two houses stand out prominently as exceptions, but when cleanliness is not observed by the citizens as a whole, a partial sanitation is of little or no use towards preserving the public health.

It is horrible to see swarms of mosquitoes attack one from every direction, to such a degree that we dare not sit down except in houses protected by netting; yet the majority of citizens preserve an attitude of culpable indifference, and it is to them, and them only, that the frustration of all our efforts and goodwill is due.

We must agree that the anti-hygienic state of the town is the fault of its inhabitants, and that it is imperative that all should exert themselves to bring about the sanitation that the town owes as a duty to the island, so that it may become worthy of being visited. The blame of this indifference must be shared by the Municipal commissions who rule the town and whose duty it is to watch over the interests of its rate-payers, by furnishing them with all the elements of hygiene, such as the conservancy of the streets, the purification of the sewers and drains, the canalisation of the sulliage-water and drinking water-supply, etc., but unhappily none of this has been done, for want of money it is said, but also because the councils are composed of individuals landlords whose interests clash with those of the city fathers.

The Municipal Commission can never effect any improvements, for as has already been said, besides the fact that the gentlemen composing it are not in a position to divert enough of their attention from their own to public affairs, the town treasury is poor and has no revenues from which it can meet the obligations of a loan—indispensable if the town is to be made healthy within a short time.

We know the island ever since 1905, and still we fail to discover any but the most insignificant improvements effected by the Municipal Commissioners, unless it be the building of a Town Hall costing many thousand

dollars, far too fine for a town whose streets are fringed with weeds, sweepings, and filth, not even paved for the most part, and, last but not least, whose houses in the great majority of cases are not worthy the name.

We do not know what was the idea governing the town councillors when they erected a house entirely beyond their means, pushing to one side the works of sanitation which should have taken the first place in their consideration as being indispensable to a town where everything has yet to be done. We profoundly lament that anyone should have thought of building a Chamber for the Council without first giving the rate-payers the benefits of a healthy city, and then embellishing it, so as to increase the wealth of the island. Yet at this day it is no novelty to anyone to be told that the town of Santo Antonio continues to be the incarnation of an infected and filthy dung heap, for besides the defects described, many citizens think it quite right to throw their domestic dejecta out of their windows straight into the roadway.

There is no slaughter-house, butcher's shop, public urinal or water-closet in this town, nor is there any drainage system (sewcrage); but in place of these we have swamps, one of which, known as the Ribeira dos Frades, has just been filled in by the initiative of the late Administrador do Conselho, Sr. Joaquim Carvalho, continued up to completion by the present Administrador, Surgeon-Captain Marques Caldeia; but unfortunately the number of labourers employed is too small to accomplish work of this order and to give the public the benefit in full of the efforts of the well-meaning citizens named.

Amid all these circumstances, we do not aim at censuring anyone in particular, but our observations spring from the natural disappointment which any Portuguese would feel had he been ten months at the head of the Health Department and got no result whatever out of the Municipality and the inhabitants of the town towards the sanitation of the place.

We shall no doubt be asked, how is the evil to be

remedied, seeing it is of so long standing? Is the island subject to some special influence, perhaps climateric or atmospheric, affecting the brain of the inhabitants, or are we under some hypnotic agency?

We know that the greater part of the municipal revenue is swallowed up by its own officialdom, and nevertheless that it has no auditor to look after its fiscal operations. The Municipal Code in force in this island was enacted in the days of Methuselah, and it helps to mislead the control. As the municipal councils as a rule have been unable to meet so as to attend to the interests of the ratepayers, or discuss the improvements to be undertaken, the result has been that everything lapses into the indifference of daily life.

We hold that Government should meanwhile empower the Administrador do Concelho, as chief magistrate of the island, to place in execution, within the limits of the powers held by the municipality, the matters most urgently demanding it. As the revenue of the municipality is very small for the sanitation of the city, we think it but right that Government should give this island a grant-in-aid of twenty thousand dollars per annum up to the complete transformation of the town; and this, we maintain, should be accomplished within a period of ten years.

Be that as it may, it is imperative that the inhabitants should free themselves from that disgraceful and degrading state into which they have fallen through their utter scorn of all hygiene, and Government should at once appoint a standing brigade of thirty men under the orders of the Health Officer, to whom full powers of fine should be conceded for the punishment of contraventions, the proceeds to go to the funds of the Administrador do Concelho. The town of Santo Antonio cannot be allowed to lie hidden in dirt, and all who love this island should raise their voices and clamour for something to be done for its relief.

We know that we were not understood at first in this island, but to-day all the inhabitants ought to be convinced that the sole reason which impelled us sometimes to treat them severely and fine them heavily was the neglect to which they consigned all sanitary measures, and our sole aim was

that the public health should not suffer from the results of their indifference.

If here we do not make mention of the President of the Parish Council, Sr. Manoel Lopes, we should be doing an injustice, seeing that he has been able, with the small resources of that Council, to bring a supply of pipe water into the heart of the town, thus effecting an improvement that long before should have been achieved by the municipality itself; for this service we cannot too highly praise and congratulate this deserving citizen.

Hospital of the Island of Principe.

Being in this island by order of the Colonial Minister for the conduct of the labours of the Sleeping Sickness Mission, and in our capacity as Health Delegate, we had to assume charge of a pseudo-infirmiry consisting of an anti-hygienic house, unfit for the accommodation of a healthy person much more of sick men.

The hovel destined for sick males, for females had no room provided, their ward having been condemned by us when we came here in 1905 to inspect the conditions in which the soldiers, then housed in it, and suffering from sleeping sickness, were living; this by order of the then Governor of S. Thomé. To our horror, on arriving here this time, we found that same hovel transformed into a hospital! Nothing short of a cataclysm on the island could permit of sick men being detained in so pernicious an abode, and this for almost a year, too. A house of this description is only fit for lower animals, and it was actually used thus, for it was here that the cattle from Southern Angola were kept isolated until a microscopic examination of their blood could show that they were not carriers of the trypanosome.

We saw that there was danger in continuing to keep the sick in such a house, but at the same time that it was impossible to have them removed to the famous sleeping sickness hospital built many years before, inasmuch

as everything was wanting for its proper working. It was also indispensable that a place should be found to accommodate the women suffering from sleeping sickness. So the Administrador of the Concelho, Sr. Carlos M. Caldeira, joined hands with us for this purpose, and we got the walls of the old infirmary, which had been abandoned to the rain and the wind, covered in.

Seeing that we could not wait for the estimates of the Public Works Department, we set to work without loss of time on the construction of wards, and by the end of September 1912 we possessed a building, completely protected against the carrier-fly, for the women patients suffering from sleeping sickness, and at the end of December there was another hospital ward ready for the reception of the men, who, up to then, had to live in the barrack-room condemned in 1905.

The two hospital wards were built by five *serviçaes* working under our personal supervision; the expenses in building materials, tiles, cement, timber, etc., did not exceed 600 dollars, or less than half the figure of the Public Works estimate.

Though we ourselves say it, modesty apart, it is to our initiative that the sick find themselves fairly well lodged; but unfortunately the rooms are small for the number of persons that have to be accommodated. At the end of June of this year, we were still waiting for the so-called Sleeping Sickness Hospital to be ready to receive patients, but this was impossible, for several indispensable pieces of work have yet to be done, and we have not the staff necessary for the due working of an infirmary.

One who did not know the state in which the sick were being treated for lack of an infirmary worthy the name, might think us precipitate in getting to work without compliance with the usual bureaucratic form and ceremony, but we are bound to proclaim it emphatically that we could not wait for sanction to be given to the estimates, for every one knows the time that this would take, especially where the island of

Principe is concerned. We should have had the patients suffering from sleeping sickness condemned to walk the streets for ever, infecting the fly with their disease.

We took it to be our duty, from the moment we came here to fight sleeping sickness, to set an example of conformity with the measures imposed on all against the spread of the disease, so that private individuals should do likewise in compliance with the law; and for this reason, immediately on our arrival here, we started upon the work necessary for the segregation of those attacked; a matter not only due to ourselves, but to the good name of Government, and to respect for the principles of humanity.

Every one knows now the comparative comfort enjoyed by the sick in the present hospital wards; these do not show the former dread of being admitted to hospital in an unhealthy hovel, and that this is so is evident from the great movement of sick persons into the hospital of Principe.

In spite of the many vexations we have had to put up with in order to carry through an improvement of this nature for sick persons of colour, we were moved by a keen desire to erect a house for the satisfactory treatment of Europeans, seeing that that hitherto in use does not possess the necessary conditions of hygiene, being very narrow, dark, and having only two doors. Unfortunately, however, we could not stay long enough in the island to supervise a work of this kind, nor could we face the responsibility of financing further works, although in this respect the public would be the chief sufferers. This we deeply regret, seeing that all our efforts have been directed to mitigating the distress of those unlucky people who require our ministrations.

Our engagements as Delegate of Health bound us not merely to see to the hospital accommodation of the sick, but also to everything relating to the welfare of all the houses in our charge, and thus we had to introduce improvements into the kitchen arrangements, the servants' quarters, the mortuary, etc., but we regret to say we

could not effect any improvements in the residence of the Delegate of Health, who is seriously inconvenienced during the rainy season because his rooms are flooded by the wet.

The work required on the house of the Health Officer can only be undertaken in the coming financial year, for want of budget provision, but we should state that the indispensable repairs applied for are urgent and must be done without loss of time, so that we may not have to bewail, perhaps a disaster similar to that which befel the hospital of S. Thomé, due to the rotting of the wood-work through the action of rain.

Urgent works, such as we have noted, should never be subject to the approval of estimates, prepared here in the local Public Works Division, and sent to repose indefinitely in the higher office of Public Works, S. Thomé, to the grave detriment of the property of the State.

When, on 30th October 1911, the sub-chief of health, Surgeon-Captain Joaquim Antonio de Oliveira, was here, he stated in his report that the hospital of the town was under construction, but when we arrived here in August 1912 we found the work entirely abandoned, the walls having been badly damaged by the rain. The same officer said that the sleeping sickness hospital was in want of a mortuary, the building destined for that purpose having been appropriated as a furniture store. We fully agree that the mortuary should never have been constructed where it is, to the windward of the hospital wards, and this we have reported to competent authority in one of the reports made by us when we were inspecting the arrangements for checking the spread of sleeping sickness.

That medical officer was of opinion that the sleeping sickness hospital should be opened without delay, and when we were sent here we brought out orders to this effect; but finding numerous hindrances to the good working of a hospital, the doctor's house not being finished, there being no accommodation for the minor staff, the water not being laid on, there being no sewers, we had not the

courage to transfer to it the infirmary of Principe, for instead of promoting the welfare of the patients, these on the contrary would have suffered in many ways, the smooth running of the hospital not being secured.

We were really anxious to make the famous sleeping sickness hospital a success, but up to the present neither the pipe water supply nor the sewerage system has been completed, nor has sanction been given for the entertainment of the establishments asked for in the report of Surgeon-Captain Oliveira.

When we get all these requirements for the due working of the sleeping sickness hospital, the town infirmary, the pharmacy, etc., should be transferred to it, and as the town cannot be abandoned by the doctors and chemist, we think there should be a medical outpost and a small ambulance for urgent cases, stationed beside the bench (for operations).

The present infirmary should be utilised for the operating bench, the ambulance and laboratory being thus distributed: the infirmary for men should become the laboratory; that for women being kept for serious cases of illness, which cannot at once be brought to the sleeping-sickness infirmary; the pharmacy should be made into an office and ambulance; the stores and the patient bench might serve for urgent operations and for first aid to persons wounded in the streets of the town; the present house of the hospital assistant and the room for European patients would be reserved for the hospital clerk of the medical outpost; the present office would become the Delegate of Health's office, and at the same time a consulting-room for poor patients; the residence of the Delegate of Health should have three small rooms so as to prevent his present single room from becoming unwholesome, as now happens for lack of three rooms or compartments, which should exist.

To sum up: The town infirmary should be converted into a medical outpost for the residence of the Health Officer, the residence of the hospital clerk, and a laboratory.

As the transference of the town infirmary to a distance from the latter involves an increase of personnel, we shall point out here what staff we consider strictly necessary for the smooth working of a hospital service. At present we have a hospital assistant and a ward attendant for the work of the infirmary, which, has latterly had to deal with from 50 to 60 sick, on an average, per mensem, and if to-day we find this staff inadequate, especially when some very grave case is brought in, this defect will surely be accentuated later on, after the transference of the infirmary and the creation of a medical outpost, the latter being indispensable for the town.

The establishment we consider necessary is : two hospital assistants, one to serve as clerk ; four attendants : twelve ward servants. For the service of this hospital, to help the Health Officer, there should be a doctor, who on the present occasion might be one of the Sleeping Sickness Commissioners, preferably the senior, doing duty here in addition to the duties of his own appointment. The Health Officer, by the nature of his office, must be constantly in the town, and will continue to live in his present quarters.

The accounts and correspondence of the sleeping sickness hospital and the admissions and discharges of the medical outpost will be done in the town by the hospital clerk, who will have a duly qualified assistant to help him.

BERNARDO FRANCISCO BRUTO DA COSTA.

Surgeon-Captain.

PRINCIPE, 20th June 1913.

SCHEDULE A.

Work done during the Ten Months' Stay (August 1912 to May 1913) of the Medical Mission in Principe.

Estates.	Population.	Persons examined.	Results.			Percentage of persons sick.					Animals examined.	Results.			Percentage of sick animals.	Zones.	Total Population.	Persons examined.	Results.			Total cases of sleeping sickness.	Percentage of sleeping sickness.		Animals examined.	Percentage of sick animals.
			Trypanosomes.	Filaria.	Malaria.	Fresh cases of sleep- ing sickness.	Filaria.	Malaria.	Total cases of sleeping sickness.	Percentage of sleeping sickness to population.		Trypanosomes.	Filaria.	Fresh cases found.					Total cases to population.							
1st ZONE.																										
Porto Real	1,078	875	31	150	59	3.5	17.1	6.7	119	11.0	56	19	1	33.9	1st Zone.	2,356	2,106	59	326	160	171	2.8	8.1	93	27.9	
Mont'Alegre	66	49	4	3	1	8.1	6.1	2.0	16	32.8	7	—	—	—												
Praia Inhamitanga	140	136	10	19	19	7.3	13.9	13.9	7	5.0	5	—	—	—												
Sant'Anna	89	84	—	5	18	—	5.8	21.4	6	6.7	8	1	—	12.5												
Saudade	31	26	1	—	6	3.8	—	23.0	2	6.4	—	—	—	—												
Nova Cuba	39	30	—	1	7	—	3.3	23.3	—	—	3	—	—	—												
S. João	66	59	1	4	4	1.6	6.7	6.7	1	1.5	2	—	—	—												
Cidade	847	847	12	144	46	1.4	17.0	5.4	20	2.3	12	6	—	50												
	2,356	2,106	59	326	160				171		93	26	1													
2nd ZONE.																										
Abbade	151	151	2	11	15	1.3	7.2	9.9	1	0.6	12	—	—	—	2nd Zone.	1,403	823	17	99	86	18	2.	1.2	61	11.4	
Santo Christo	99	99	1	17	9	1.0	17.1	9.0	3	3.0	6	1	—	16.6												
Nova Estrella	166	113	—	15	17	—	12.3	15.0	5	4.3	13	1	—	7.6												
Terreiro Velho	267	242	10	41	26	3.7	16.5	11.1	6	2.2	16	3	—	18.7												
Bella Vista	154	140	4	5	15	2.8	3.5	10.7	3	1.9	7	2	—	28.5												
Inf. D. Henrique	616	78	—	10	4	—	12.8	5.1	—	—	7	—	—	—												
	1,403	823	17	99	86				18		61	7	—													
3rd ZONE.																										
Sundy	595	516	37	18	18	7.1	3.4	3.4	144	24.2	24	5	—	20.8	3rd Zone.	1,179	1,063	49	29	40	173	4.6	14.8	52	11.7	
Ribeira Izé	70	70	—	3	5	—	4.2	7.1	1	1.4	4	—	—	—												
Bom-Bom	66	65	4	3	7	6.1	4.6	10.7	4	6.0	8	1	—	12.5												
Santa Ritta	80	80	1	2	1	1.2	2.5	1.5	—	—	5	—	—	—												
Cascalheira	40	36	1	1	3	2.7	2.7	8.3	1	2.5	—	—	—	—												
Aguiem	29	29	—	—	1	—	—	3.4	—	—	4	—	1	—												
Futuro	27	27	2	1	1	7.4	3.7	3.7	2	7.4	2	—	—	—												
Paciencia	159	140	3	1	1	2.1	0.6	0.6	20	12.6	4	1	—	2.5												
Bello Monte	113	100	1	—	3	1.0	3.0	3.0	1	0.9	1	—	—	—												
	1,179	1,063	49	29	40				173		52	7	1													
GRAND TOTAL	4,938	3,992	125	454	286				362		206	40	2			4,938	3,992	125	454	286	362			206		



SCHEDULE B.

Comparative Statement of Percentages obtaining in the Five Zones into which the Island was divided for Purposes of the Correa Mendes Sleeping Sickness Report of 1908. *Vide* page 11 of present Report.

	Northern	East and Western	North-Eastern	Southern	Cidade
Total Population	880	1,337	559	1,315	847
Number of persons examined	796	1,094	513	742	847
Result of Analysis:					
Trypanosomes	43	39	17	14	12
Filaria	26	162	26	98	144
Malaria	35	84	46	75	46
Number of existing cases of Sleeping Sickness	150	139	36	19	20
Percentage of new cases to persons examined	5.4	3.5	3.3	1.8	1.4
Percentage of total cases to population	17.1	10.3	7.3	1.5	2.3



SCHEDULE C.

Mortality from Disease during the ten months' stay (August 1912 to May 1913) of the Medical Mission in Principe.

[illegible]

SCHEDULE D.

(See page 80)

Summary of Sanitary Work done by the Official Brigade.

Date.	Area cleaned.	Insects and Animals killed.				Estates.	Owners.
		Flies.	Pigs.	Lag- aias.	Dogs.		
1912.	Sq. Metres.						
August 11 . . .	4,000	25,412	41	48	12	Pau Fita	José Ferreira do Amaral.
" 17 . . .							
" 17 . . .	1,200	—	—	—	27	Cidade	Camara Municipal.
" 27 . . .							
" 28 . . .	4,000	12,021	13	16	9	Antracia	Dr Damas Mora.
September 8 . . .							
" 9 . . .	700	159	—	3	9	Oque Ponto	Manoel Pedroso, P. and M. do Socorro.
" 12 . . .							
" 13 . . .	3,000	3,788	—	12	13	Santa Victoria and Ilheu	João M. da Costa Lavres.
" 15 . . .							
" 16 . . .	2,000	2,575	9	12	7	Boa Esperança	D. Adelaide Saldanha.
" 19 . . .							
" 20 . . .	1,200	1,479	7	6	9	Ilheu	Estevão Borges.
" 23 . . .							
" 24 . . .	3,000	11,513	2	25	13	Manoel Affonso and Oque Rosario	Fortuna d'Oliveira.
" 29 . . .							
" 30 . . .	1,200	—	—	—	7	Cidade	Camara Municipal.
October 6 . . .							
" 7 . . .	1,000	1,317	1	16	4	Antracia	Alfredo Lazaro.
" 9 . . .							
" 10 . . .	2,000	1,112	—	3	6	Uba-Budo	Ferreira Gonçalves.
" 15 . . .							
" 16 . . .	2,000	2,974	6	7	11	M. Affonso and waste lands	Narciso Carcereiro.
" 18 . . .							
" 19 . . .	6,000	28,374	56	35	19	Conceição and Ribeira Laura	Gabriel Fernandes.
" 24 . . .							
" 25 . . .	3,000	19	—	—	13	Cidade and Government lands	Camara Municipal and Government.
December 8 . . .							
" 9 . . .	6,000	8,346	25	23	5	Pau Cavallo and native lands	Unknown.
" 31 . . .							
1913.							
January 1 . . .	1,500	1,325	7	6	3	S. Guzmão	Heirs of Dona Delphina Nascimento.
" 6 . . .							
" 7 . . .	1,500	107	—	6	7	Potó	D. Maria da Conceição Benedicto.
" 9 . . .							
" 10 . . .	1,000	—	—	—	—	Matú and Matende	M. Vaz d'Oliveira, M. Assunção and Hilario.
" 13 . . .							
" 14 . . .	2,300	1,235	4	6	0	Ribeira Izé	M. Ferreira Marques.
" 23 . . .							
" 24 . . .	200	9	—	—	6	Ribeira Cuté	Manoel Pedroso.
" 25 . . .	2,000	342	—	3	6	Native Lands	Heirs of F. X. Paixao.
" 28 . . .							
" 29 . . .	1,400	1,312	2	4	7	Potó	D. Maria Daniel.
" 31 . . .							
February 1 . . .	2,000	1,315	—	—	—	Streams and Swamps	Gabriel Fernandes.
" 3 . . .							
" 4 . . .	50	13	—	—	3	Oque Rosario	V. Marques Farinha.
" 5 . . .	—	49	—	—	—	Streams and Swamps of Antracia	Dr Damas Mora and Alfredo Lazaro.
" 7 . . .							
" 8 . . .	3,000	5,716	39	6	18	Azeitona	Ferreira Marques (leased).
" 22 . . .							
" 25 . . .	9,000	9,573	23	7	26	Porto Real	Sociedade Colonial Agricola.
April 16 . . .							
" 17 . . .	2,000	444	—	6	19	Pico Potó	Balthazar Manoel da Cruz.
" 24 . . .							
" 25 . . .	2,000	144	—	2	13	Native lands	Unknown.
May 30 . . .							
		110,691	235	251	272		



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